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RECENT FORAMINIFERA FROM OFF THE WEST COAST OF AMERICA

BY

JOSEPH A. CUSHMAN

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CONTENTS

PAGE

Introduction 124
Data for stations from which material was examined 126
Systematic descriptions of the fauna 128
Family Astrorhizidae 128
Genus Rhabdammina 128
Rhabdammina abyssorum 128
Family Rhizamminidae 129
Genus Bathysiphon 129
Bathysiphon rufus 129
Bathysiphon arenacea n. sp. 129
Bathysiphon fusca, n. sp. 129
Family Saccamminidae 130
Subfamily Psammosphaerinae 130
Genus Psammosphaera 130
Psammosphaera fusca 130
Subfamily Saccammininae 130
Genus Saccammina 130
Saccammina sphaerica 130
Genus Proteonina 130
Proteonina difflugiformis 130
Family Hyperamminidae 131
Subfamily Hyperammininae 131
Genus Hyperammina 131
Hyperammina elongata 131
Genus Jaculella 131
Jaculella acuta 131
Jaculella obtusa 131
Subfamily Dendrophryinae 132
Genus Saccorhiza 132
Saccorhiza ramosa 132
Family Reophacidae 132
Subfamily Aschemonellinae 132
Genus Kalamopsis 132
Kalamopsis (?) californica n. sp. 132
Subfamily Reophacinae 132
Genus Reophax 132
Reophax dentaliniformis 132
Reophax excentricus 133

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PAGE
Family Ammodiscidae ... 133
Genus Ammodiscus ... 133
Ammodiscus incertus ... 133
Family Lituolidae ... 134
Subfamily Haplophragmiinae ... 134
Genus Haplophragmoides ... 134
Haplophragmoides scitulum ... 134
Haplophragmoides sphaeriloculum ... 134
Haplophragmoides advena ... 135
Haplophragmoides planissima n. sp. ... 135
Haplophragmoides tenuis n. sp. ... 135
Subfamily Lituolinae ... 136
Genus Cyclammina ... 136
Cyclammina cancellata ... 136
Family Textulariidae ... 136
Subfamily Textulariinae ... 136
Genus Textularia ... 136
Textularia cf. abbreviata ... 136
Family Verneuilinidae ... 137
Genus Verneuilina ... 137
Verneuilina scabra ... 137
Verneuilina advena ... 137
Verneuilina bradyi ... 137
Genus Gaudryina ... 138
Gaudryina triangularis ... 138
Genus Clavulina ... 138
Clavulina communis ... 138
Clavulina communis var. pallida n. var. ... 138
Family Miliolidae ... 139
Genus Quinqueloculina ... 139
Quinqueloculina sp. (?) ... 139
Genus Sigmoilina ... 139
Sigmoilina tenuis ... 139
Genus Triloculina ... 139
Triloculina tricarinata ... 139
Genus Biloculina ... 140
Biloculina depressa ... 140
Biloculina murrhyna ... 140
Biloculina serrata ... 140
Biloculina elongata ... 141
Biloculina lucernula ... 141
Family Trochamminidae ... 141
Subfamily Trochammininae ... 141
Genus Trochammina ... 141
Trochammina globigeriniformis ... 141
Trochammina turbinata ... 142
Trochammina pacifica ... 142
Genus Nouria ... 142
Nouria polymorphinoides ... 142
Family Lagenidae ... 143
Subfamily Nodosariinae ... 143

PAGE
Genus Cristellaria ... 143
Cristellaria cf. convergens ... 143
Genus Robulus ... 143
Robulus cultratus ... 143
Genus Nodosaria ... 143
Nodosaria pyrula ... 143
Genus Glandulina ... 143
Glandulina laevigata ... 143
Subfamily Lageninae ... 144
Genus Lagena ... 144
Lagena gracillima ... 144
Lagena elongata ... 144
Lagena gracilis ... 144
Lagena hexagona var. scalariformis ... 145
Lagena lagenoides ... 145
Lagena substriata ... 145
Lagena sulcata ... 145
Lagena acuticosta ... 146
Lagena williamsoni ... 146
Lagena alveolata var. plebeia ... 146
Lagena orbignyana var. elliptica ... 146
Lagena hertwigiana var. undulata ... 146
Lagena lamellata ... 147
Lagena hispida ... 147
Lagena sacculus ... 147
Family Nonionidae ... 147
Genus Nonion ... 147
Nonion cf. scapha ... 147
Nonion cf. punctata ... 148
Nonion labradorica ... 148
Nonion umbilicatula ... 148
Nonion umbilicatula var. pacifica ... 149
Genus Nonionella ... 149
Nonionella miocenica ... 149
Family Buliminidae ... 149
Subfamily Turrilininae ... 149
Genus Buliminella ... 149
Buliminella subfusiformis var. tenuata n. var. ... 149
Subfamily Bulimininae ... 150
Genus Bulimina ... 150
Bulimina ovula ... 150
Bulimina ovata ... 150
Bulimina affinis ... 150
Bulimina spinifera n. sp. ... 151
Bulimina barbata n. sp. ... 151
Bulimina inflata ... 151
Bulimina rostrata ... 152
Bulimina pulchella ... 152
Bulimina pagoda n. sp. ... 152
Genus Globobulimina ... 153
Globobulimina pacifica ... 153

PAGE
Subfamily Virgulininae ... 153
Genus Virgulina ... 153
Virgulina schreibersiana ... 153
Virgulina subsquammosa ... 154
Virgulina cornuta ... 154
Genus Bolivina ... 154
Bolivina plicata ... 154
Bolivina costata ... 155
Bolivina punctata ... 155
Bolivina argentea ... 155
Bolivina pseudobeyrichi ... 156
Bolivina pygmaea ... 156
Bolivina subadvena ... 156
Bolivina subadvena var. spissa ... 157
Bolivina seminuda ... 157
Subfamily Uvigerininae ... 157
Genus Uvigerina ... 157
Uvigerina pigmea var. curticosta n. var. ... 157
Uvigerina peregrina ... 158
Uvigerina peregrina var. bradyana ... 158
Uvigerina ampullacea ... 158
Uvigerina senticosa n. sp. ... 159
Genus Angulogerina ... 159
Angulogerina carinata n. sp. ... 159
Family Rotaliidae ... 159
Subfamily Spirillininae ... 159
Genus Spirillina ... 159
Spirillina vivipara ... 159
Subfamily Discorbisinae ... 160
Genus Discorbis ... 160
Discorbis isabelleana ... 160
Genus Valvulineria ... 160
Valvulineria araucana ... 160
Valvulineria vilardeboana var. glabra n. var. ... 161
Valvulineria inaequalis ... 161
Valvulineria inflata ... 161
Genus Gyroidina ... 162
Gyroidina soldanii ... 162
Subfamily Rotaliinae ... 162
Genus Eponides ... 162
Eponides patagonica ... 162
Eponides tenera ... 163
Subfamily Siphonininae ... 163
Genus Epistomina ... 163
Epistomina partschiana ... 163
Subfamily Baggininae ... 164
Genus Cancris ... 164
Cancris auricula ... 164
Family Cassidulinidae ... 164
Subfamily Ceratobuliminae ... 164
Genus Pulvinulinella ... 164
Pulvinulinella culter ... 164

PAGE
Pulvinulinella pacifica n. sp. 165
Pulvinulinella bradyana n. sp. 165
Subfamily Cassidulininae 166
Genus Cassidulina 166
Cassidulina pulchella 166
Cassidulina corbyi 166
Cassidulina limbata 166
Cassidulina tortuosa 167
Cassidulina crassa 167
Cassidulina subglobosa var. ornata n. var. 167
Cassidulina delicata n. sp. 168
Genus Cassidulinoides 168
Cassidulinoides bradyi 168
Subfamily Ehrenbergininae 168
Genus Ehrenbergina 168
Ehrenbergina compressa n. sp. 168
Ehrenbergina bradyi 169
Family Chilostomellidae 169
Subfamily Chilostomellinae 169
Genus Chilostomella 169
Chilostomella oolina 169
Subfamily Allomorphinellinae 170
Genus Chilostomellina 170
Chilostomellina fimbriata 170
Genus Pullenia 170
Pullenia bulloides 170
Pullenia quinqueloba 170
Pullenia apertura n. sp. 171
Subfamily Sphaeroidininae 171
Genus Sphaeroidina 171
Sphaeroidina bulloides 171
Family Globigerinidae 171
Subfamily Globigerininae 171
Genus Globigerina 171
Globigerina bulloides 171
Globigerina digitata 172
Globigerina conglomerata 172
Genus Globigerinoides 173
Globigerinoides rubra 173
Globigerinoides sacculifera 173
Globigerinoides conglobata 173
Genus Globigerinella 174
Globigerinella aequilateralis 174
Subfamily Orbulininae 174
Genus Orbulina 174
Orbulina universa 174
Subfamily Pulleniatininae 174
Genus Pulleniatina 174
Pulleniatina obliquiloculata 174
Genus Sphaeroidinella 175
Sphaeroidinella dehiscens 175

PAGE
Family Globorotaliidae 175
Genus Globorotalia 175
Globorotalia tumida 175
Globorotalia menardii 175
Globorotalia scitula 175
Globorotalia truncatulinoides 176
Family Anomalinidae 176
Subfamily Anomalininae 176
Genus Planulina 176
Planulina ornata 176
Genus Pellatispira 176
Pellatispira pauperata 176
Subfamily Cibicidinae 177
Genus Cibicides 177
Cibicides vermiculata 177
Cibicides ungeriana 177

INTRODUCTION

In March, 1926, Dr. T. Wayland Vaughan, Director of the Scripps Institution of Oceanography, sent me a collection of bottom samples. These are separates on a mesh of 0.25 mm. In nearly all the samples, the amount of material was very small, yet the number of species is considerable when the whole collection is studied. A list of the stations is given later with position and depth.

In a paper, Status of the General Knowledge of the Pacific Foraminifera, published by me in 1921 (Special Publications of Bernice P. Bishop Museum, No. 7, pp. 284–289), appeared a paragraph calling attention to the regions of the Pacific most in need of work on the foraminifera. The following sentence may be quoted:

> Except for the few stations dredged by the *Challenger* off the Coast of Chile, and the specimens described many years ago by d'Orbigny, almost nothing is known of the foraminiferal fauna of the shallow water and medium depths of the entire Coast of Western America, and this should prove to be very interesting, both in its problems of distribution and the new forms which will certainly be obtained.

This collection sent me by Dr. Vaughan fills a part of this gap in our records. For this reason, it has been of more than ordinary interest. Another point of view is the relationship of this fauna to the late Tertiary deposits of California and adjacent regions, of which the conditions of deposition are very little known. As there are so many of the species common both to the recent deposits studied and the late Tertiary, some of this lack of data may now be filled.

The work published by d'Orbigny in 1839 as a result of his South American voyage, contains many species of foraminifera well illus-

trated and described. As in the example of his Cuban monograph published the same year, most of his species have not been referred to by later authors. Just as my own studies of West Indian material have shown that many of the species of that region are local and should bear the names given them by d'Orbigny, so the study of this West Coast collection shows the identity of many of the species with those described by d'Orbigny from the coasts of Chile and Peru. This identity is most marked, as might be expected, toward the southern part of the area represented in these collections.

The foraminiferal fauna represented here has several relationships that are very interesting. A few of the species are pelagic and therefore of very wide distribution, depending largely upon the influence of ocean currents. Nearly all these species, represented by certain of the Globigerinidae and Globorotaliidae, are from the more southerly stations. The species of one group, represented by species of *Valvulineria* and others, are identical with those described by d'Orbigny from the coasts of South America and are species, so far as known, largely limited to the offshore waters of the eastern Pacific. Species of another group represented by *Virgulina cornuta* are known to range widely in the deeper and cooler waters of both the north and south Pacific. A very few species, an example of which is *Nonion labradorica,* seem to be cold-water species, possibly circumpolar, which come southward into a part of this Pacific area.

The number of new forms is not very large, yet on the whole the fauna is a very distinct one. The great dominance of *Cassidulina, Uvigerina, Bolivina, Bulimina, Pulvinulinella,* and *Valvulineria* is very similar to that of the Pliocene of California. The almost total absence of species of *Cristellaria, Nodosaria, Polymorphina,* and *Textularia* is surprising.

In order to reduce the number of references, the method has been adopted of giving only the original reference, and then a reference to a recent work in which the synonymy is fairly complete, such as Bulletin 71 or Bulletin 104 of the United States National Museum.

The type figured and all unique specimens are to be deposited in the United States National Museum at Washington. The others are in the collection of the Scripps Institution of Oceanography at La Jolla, California, and, through the kindness of Dr. Vaughan, in my own collection at Sharon, Massachusetts.

The plates are from photographs of the original specimens taken in the laboratory at Sharon.

The classification here adopted is that which I have recently published in An Outline of a Re-classification of the Foraminifera (Contrib. Cushman Lab. Foram. Research, vol. 3, pt. 1, 1927).

DATA FOR STATIONS FROM WHICH MATERIAL WAS EXAMINED

In the following table, the data for the various stations will be found, and the occurrences are given under each species. The collections are from bottom samples taken by the U. S. Coast and Geodetic Survey ships "Guide," "Lydonia," and "Discoverer," and by the boat of the Scripps Institution. The depth is given in fathoms unless otherwise designated.

Designation	Latitude N	Longitude W	Depth
Guide 2(24)	43–03	124–58	524
Guide 3(24)	43–03	124–51.5	118
Guide 4(24)	43–08	124–55	385
Guide 6(24)	43–09	124–42	112
Guide 7(24)	43–07	124–41	95
Guide 9(24)	43–06	124–53	254
Guide 11(24)	42–58	124–57	341
Guide 13(24)	43–15	124–53	227
Guide 14(24)	43–15	124–44	135
Guide 15(24)	43–02	125–00	571
Guide 16(24)	43–00	125–07	1045
Guide 17(24)	43–02	124–55	364
Guide 20(24)	43–05	125–01	640
Guide 21(24)	43–06	125–08	900
Guide 22(24)	43–12	125–01	594
Guide 23(24)	43–13	124–54	302
Guide 24(24)	43–14	124–43	127
Guide 26(24)	42–55	124–45	82
Guide 28(24)	42–55	124–54	182
Guide 29(24)	45–54.2	124–48	109
Guide 30(24)	42–54	124–43	80
Guide 31(24)	42–53.8	124–48	120
Guide 32(24)	42–54	124–44	83
Guide 36(24)	43–08	124–59	577
Guide 1(25)	32–08	119–06.5	740
Guide 2(25)	31–55	119–37	1370
Guide 3(25)	32–02	119–43	1390
Guide 5(25)	32–23	119–23.5	815
Guide 8(25)	32–26	118–07	256
Guide 9(25)	33–29	117–57	290
Guide 10(25)	33–13	119–57	412
Guide 12(25)	32–28	118–20	429
Guide 13(25)	33–17	117–55	396
Guide 14(25)	32–08	117–55	486
Guide 15(25)	33–08	118–10	578
Guide 16(25)	33–25	118–18	465
Guide 17(25)	33–30	118–17	553
Guide 18(25)	33–30	118–05	253

Designation	Latitude N	Longitude W	Depth
Guide 20(25)	33–15	117–53	347
Guide 21(25)	33–04	117–53	385–384
Guide 22(25)	33–05	118–08	532
Lydonia 1(22)	31–42.2	117–31.7	697
Lydonia 3(22)	29–42	116–49	884
Lydonia 4(22)	28–45.5	116–23.3	1910
Lydonia 7(22)	26–35	114–38	2040
Lydonia 8(22)	25–14.5	113–20	1580
Lydonia 9(22)	24–51.7	113–06	1105
Lydonia 10(22)	24–45	112–59	1216
Lydonia 12(22)	24–30.5	112–46.5	917
Lydonia 17(22)	21–37	109–04.5	1565
Lydonia 18(22)	21–37	109–04.5	1710
Lydonia 19(22)	20–15	107–21	1803
Lydonia 20(22)	17–51	103–25.7	1500
Lydonia 21(22)	17–18.8	102–22	1197
Lydonia 22(22)	16–21.5	100–35	2390
Lydonia 25(22)	7–56.5	83–01	810
Lydonia 26(22)	7–49	83–04	938
Lydonia 27(22)	7–42	82–53.5	938
Lydonia 30(22)	7–01	81–48.7	428
Lydonia 31(22)	7–00	81–35.5	478
Lydonia 33(22)	7–01.5	80–59	800
Lydonia 34(22)	7–06	80–42.5	705
Lydonia 35(22)	7–04.5	80–22	1061
Discoverer 9D	36–40	122–26	1121
Discoverer 9E	36–35	122–42.5	1597
Discoverer 10E	36–34.7	122–47.3	1618
Discoverer 12E	36–36.5	122–53	1607
Discoverer 16E	36–34	123–08	1886
Discoverer 18E	36–35.5	123–00	1769
Discoverer 20E	36–36.5	122–53.5	1595
Discoverer 22E	36–37.5	122–47.5	1632
Discoverer 3F	36–44	122–38	1463
Discoverer 10F	36–43	123–11.5	1822
Discoverer 11F	36–48	123–11.5	1818
Discoverer 17F	36–48	137–42.5	1301
Discoverer 6G	37–00	122–48.5	788
Discoverer 11G	36–59	123–13	1540
Discoverer 12G	36–31	123–13	1872
Discoverer 15G	36–31	122–58	1673
Discoverer 17G	36–31.75	122–49	1664
Discoverer 19J	36–50	122–15	735
Discoverer 20K	36–51.25	122–19	750
Discoverer 14L	36–47	122–15.75	434
Discoverer 20M	36–54	122–18	356
Discoverer 28M	36–48.5	122–10	250
Discoverer 42M	36–34	122–03	516
Discoverer 3N	36–51	121–53	132
Discoverer 13N	36–47.5	121–58	138
Discoverer 14N	36–46	121–57.5	278
Discoverer 15N	36–47.5	122–03.25	108

Designation	Latitude N	Longitude W	Depth
Discoverer 27N	36–41.5	122–05	817
Discoverer 4Q	36–40	122–08	736
Discoverer 1R	36–42	122–12.5	564
Scripps 1530 (G4)	32–52–45	117–19	66 meters
Scripps 1531 (G5)	32–53	117–20–15	104 meters
Scripps 1534 (G8)	32–54–15	117–19–30	239 meters
Scripps 1536 (G10)	32–54–15	117–17–30	305 meters
Scripps 1618 (I3)	32–55–30	117–21–45	380 meters
Scripps 1619 (I4)	32–56–30	117–21–30	485 meters
Scripps 1622 (I7)	32–55–45	117–18	80 meters

Off Scripps Institution pier
Location 1. 1½ m. S of Institution pier, 200 to 210 ft.
Location 2. 1½ m. S of Institution pier, 95 ft.
Location 3. 1½ m. W of Institution pier, 165 ft.
Location 4. 1½ m. W of Institution pier, 200 ft.
Station 2, specimen 679–81. 5 m. W of Institution pier, 274 meters.

In the following text, where Guide stations are without date, 1925 should be understood.

SYSTEMATIC DESCRIPTIONS OF THE FAUNA

Family ASTRORHIZIDAE

Genus **Rhabdammina** W. B. Carpenter, 1869

Rhabdammina abyssorum W. B. Carpenter

Rhabdammina abyssorum M. Sars, Forh. Vid. Selsk. Christiania, 1868, p. 248 (*nomen nudum*); W. B. Carpenter, Ann. Mag. Nat. Hist., ser. 4, vol. 4, 1869, p. 288; Cushman, U. S. Nat. Mus., Bull. 104, pt. 1, 1918, p. 15, pl. 6, fig. 1; pl. 7, fig. 1.

Test free, consisting of a central subglobular chamber with, typically, three radiating arms (at times varying in number to five) of nearly uniform diameter with no divisions; when three, usually in the same plane but the accessory arms above this number often added in a different plane; wall of sand grains, firmly cemented, with a reddish-brown cement often giving a decided tinge of color to the whole test, interior fairly smooth and reddish from the color of the cement, exterior roughly finished; apertures formed by the circular openings at the ends of the tubular arms.

Fragmentary specimens occurred at Guide station 9; Lydonia stations 9 and 35.

Family RHIZAMMINIDAE

Genus **Bathysiphon** G. O. Sars, 1871

Bathysiphon rufus de Folin

Bathysiphon rufum de Folin, Act. Soc. Linn. Bordeaux, vol. 40 (ser. 4, vol. 10), 1886, p. 283, pl. 6, figs. 8*a*–*c*; Cushman, U. S. Nat. Mus., Bull. 104, pt. 1, 1918, p. 15.

Test free, elongate, tapering, slightly curved, with irregular constrictions on the exterior, smooth, and polished; wall comparatively thick, composed of sponge spicules, usually fragmentary, with a large amount of hard siliceous cement; color reddish- or yellowish-brown; ends of the test open, forming apertures.

The only occurrence of this common species was at Lydonia station 4.

Bathysiphon arenacea Cushman n. sp.

Plate 1, figure 2

Test elongate, slightly tapering, slightly constricted; wall very thick, surface smooth but not polished, with a considerable amount of fine sand grains darker than the light grayish-brown cement. Diameter, 0.50 mm.

Holotype (U. S. Nat. Mus., No. 20286) from Guide station 3, Lat. 32° 02′ N, Long. 119° 43′ W; 1390 fathoms. A single fragment also occurred at Guide station 4.

This is a very thick-walled species, the opening being only about one-fourth the diameter of the test.

Bathysiphon fusca Cushman n. sp.

Plate 1, figure 1

Test elongate, slender, subcylindrical; wall thin, smooth, shining, yellow-brown, composed of fine sand grains with an abundance of yellowish cement in which are numerous rounded bodies of uniform size. Diameter, 0.40 mm.

Holotype (U. S. Nat Mus., No. 20287) from Guide station 17, Lat. 33° 30′ N, Long. 118° 17′ W; 553 fathoms. It also occurred at Guide station 16.

In some of its characters this species resembles *Bathysiphon argenteus* Heron-Allen and Earland from the eastern Atlantic. *B. fusca* is larger, yellowish-brown in color, and the spicular bodies instead of being rod-shaped are circular. It has a decided luster.

Family SACCAMMINIDAE

Subfamily PSAMMOSPHAERINAE

Genus **Psammosphaera** F. E. Schulze, 1875

Psammosphaera fusca F. E. Schulze (?)

There are a very few specimens from Scripps station 1534 that have no definite aperture and may belong to this species.

Subfamily SACCAMMININAE

Genus **Saccammina** W. B. Carpenter, 1869

Saccammina sphaerica G. O. Sars

Saccammina sphaerica (M. Sars, *nomen nudum*, Forh. Selsk. Christiania, 1868 [1869], p. 248); G. O. Sars, Forh. Selsk. Christiania, 1871, p. 250; Cushman, U. S. N. Mus., Bull. 104, pt. 1, 1918, p. 44, pl. 16, figs. 4, 5; pl. 19, figs. 2–5.

Test typically free, spherical, consisting of a single chamber without divisions; wall of sand grains, firmly cemented, interior smooth; aperture single, circular, usually with a slight neck; color variable. Diameter, 0.45 mm.

The only specimens are from Discoverer station 12E.

Genus **Proteonina** Williamson, 1858

Proteonina difflugiformis (H. B. Brady)

Reophax difflugiformis H. B. Brady, Quart. Jour. Micr. Sci., vol. 19, 1879, p. 51, pl. 4, figs 3*a*, *b*.

Proteonina difflugiformis Rhumbler, Arch. Prot., vol. 3, 1903, p. 245, figs. 80*a*, *b*; Cushman, U. S. Nat. Mus., Bull. 104, pt. 1, 1918, p. 47, pl. 21, figs. 1, 2.

Test free, consisting of a single elongate oval or pyriform chamber with a more or less distinct tubular neck usually tapering gradually from the body of the chamber, undivided; wall of sand grains of variable size, firmly cemented; aperture simple, circular, terminal. Diameter, up to 0.50 mm.

The species occurred at the following stations: Guide 13, 18, 26(24), 29(24), 31(24), and 32(24); Discoverer 17G; Scripps 1534, 1618.

The grains of the test are mostly clear quartz sand of very irregular size; the amount of cement is small. The exterior is often more irregular than usual in this species.

Family HYPERAMMINIDAE

Subfamily Hyperammininae

Genus **Hyperammina** H. B. Brady, 1878

Hyperammina elongata H. B. Brady

Hyperammina elongata H. B. Brady (part), Ann. Mag. Nat. Hist., ser. 5, vol. 1, 1878, p. 433, pl. 20, figs. 2*a*, *b*; Cushman, U. S. Nat. Mus., Bull. 104, pt. 1, 1918, p. 74, pl. 29, fig. 4.

Test elongate, cylindrical, consisting of a subglobular proloculum and long, slender, tubular second chamber of lesser diameter than the proloculum; wall of sand grains firmly cemented, usually a single layer, smooth within, exterior often rough, cement yellowish-brown; aperture formed by the open end of the tube. Diameter, up to 0.35 mm.

The species occurred at the following stations: Lydonia 4; Guide 3.

Genus **Jaculella** H. B. Brady, 1879

Jaculella acuta H. B. Brady

Jaculella acuta H. B. Brady, Quart. Jour. Micr. Sci., vol. 19, 1879, p. 35, pl. 3, figs. 12, 13; Cushman, U. S. Nat. Mus., Bull. 104, pt. 1, 1918, p. 84, pl. 32, figs. 1–4.

Test elongate, straight, tapering, tubular, proximal end closed and acutely pointed, distal end broader, slightly constricted to form the circular aperture; wall of coarse sand grains firmly cemented. Diameter, 0.35 mm.

The only specimen is from Guide station 3.

Jaculella obtusa H. B. Brady

Jaculella obtusa H. B. Brady, Proc. Roy. Soc. Edinburgh, vol. 11, 1882, p. 714; Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 256, pl. 22, figs. 19–22; Cushman, U. S. Nat. Mus., Bull. 104, pt. 1, 1918, p. 85, pl. 32, fig. 5.

Test elongate, straight, tubular, slightly if at all tapering, proximal end closed, obtusely rounded, distal end but slightly broader, its open end serving as the aperture; wall of coarse sand grains, firmly cemented. Diameter, 0.25 mm.

The only specimen is from Lydonia station 33.

Subfamily Dendrophryinae

Genus **Saccorhiza** Eimer and Fickert, 1899

Saccorhiza ramosa (H. B. Brady)

Hyperammina ramosa H. B. Brady, Quart. Jour. Micr. Sci., vol. 19, 1879, p. 33, pl. 3, figs. 14, 15.

Saccorhiza ramosa Eimer and Fickert, Zeitschr. Wiss. Zool., vol. 65, 1899, p. 670; Cushman, U. S. Nat. Mus., Bull 104, pt. 1, 1918, p. 81, pl. 30, figs. 3, 4.

Test free, consisting of an ovoid proloculum, passing into a short tubular chamber, soon becoming branched, of nearly uniform diameter throughout; wall of sand grains, firmly cemented, often with sponge spicules incorporated in the outer layer; aperture formed by the open ends of the tubular chamber.

Fragments occur at Lydonia station 4.

Family REOPHACIDAE

Subfamily Aschemonellinae

Genus **Kalamopsis** de Folin, 1882

Kalamopsis (?) californica Cushman n. sp.

Plate 1, figure 4

Test irregularly cylindrical, constricted at intervals; wall thin, of cement with occasional sand grains on the exterior; wall gray, dully shining. Diameter, 0.50–0.60 mm.

Holotype (U. S. Nat. Mus., No. 20288) from one-half mile west of Scripps Institution pier, La Jolla, California, 165 feet.

There are numerous broken tubes, with thin walls mostly of cement, with a considerable luster, and with sand grains incorporated in the exterior, which may belong to this genus. No entire specimens were seen.

Subfamily Reophacinae

Genus **Reophax** Montfort, 1808

Reophax dentaliniformis H. B. Brady

There is a single three-chambered specimen from Guide station 21, which is perhaps nearer this species than any other. The wall is very delicate, made of clear sand grains with a small amount of cement and very neatly finished.

Reophax excentricus Cushman

Plate 1, figure 3

Reophax excentricus Cushman, U. S. Nat. Mus., Bull. 71, pt. 1, 1910, p. 92, fig. 134.

Test small, composed of a nearly straight or somewhat curved series of chambers, the size rapidly increasing with each newly added chamber; wall of coarse sand grains, rather neatly cemented; aperture with a short tubular neck at one side of the axis of the test; color gray. Length, up to 1.75 mm; breadth, 0.65 mm.

Specimens occurred at the following stations: Guide 15, 21, 22, 26(24); Lydonia 27, 33, 35; Discoverer 42M; Scripps 1536, 1622, and off the pier at La Jolla in 200–210 feet.

The species was originally described from the Bering Sea. It would probably be referred by some authors to *Reophax scorpiurus* Montfort but that species is at best a doubtful one and was probably formed of calcareous sand and with different cement than this cold-water species of the eastern Pacific.

Family AMMODISCIDAE

Genus **Ammodiscus** Reuss, 1861

Ammodiscus incertus (d'Orbigny)

Operculina incerta d'Orbigny, *in* De la Sagra, Hist. Fis. Pol. Nat., Cuba, 1839, Foraminifères, p. 49, pl. 6, figs. 16, 17.

Ammodiscus incertus H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 330, pl. 38, figs. 1–3; Cushman, U. S. Nat. Mus., Bull. 104, pt. 1, 1918, p. 95, pl. 39.

Test planospiral, closely coiled, composed of an oval proloculum and long, coiled, tubular second chamber, undivided; wall finely arenaceous with a large proportion of yellowish- or reddish-brown cement; aperture formed by the open end of the chamber. Diameter, up to 3.25 mm.

Single specimens occurred at Guide station 2 and Lydonia station 19.

This species is very abundant farther north along the coast, but was very rare in these finely screened samples.

Family LITUOLIDAE

Subfamily HAPLOPHRAGMIINAE

Genus **Haplophragmoides** Cushman, 1910

Haplophragmoides scitulum (H. B. Brady)

Haplophragmoides scitulum H. B. Brady, Quart. Jour. Micr. Sci., vol. 21, 1881, p. 50; Proc. Roy. Soc. Edinburgh, vol. 11, 1882, p. 711; Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 308, pl. 34, figs. 11–13; Chapman, Proc. Zool. Soc. London, 1895, p. 16; Flint, Ann. Rept. U. S. Nat. Mus., 1897 (1899), p. 276, pl. 20, fig. 2; Chapman, Rept. British Antarctic Exped. Geol., vol. 2 (1916), 1917, p. 64, pl. 3, fig. 22; Heron-Allen and Earland, British Antarctic Exped. Zool., vol. 6, 1922, p. 99.

Haplophragmoides scitulum Cushman, U. S. Nat. Mus., Bull. 100, pt. 1, 1910, p. 103, figs. 153–155; Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1008; Cushman, U. S. Nat Mus., Bull. 104, pt. 2, 1920, p. 42, pl. 8, fig. 2; Bull. 100, vol. 4, 1921, p. 80.

Test planospiral, somewhat compressed, excavated in the umbilical region, composed of about three coils, partially involute, periphery broadly rounded, not lobulated; chambers 8–11 in the last-formed coil, broad and low; sutures slightly if at all depressed; wall arenaceous, firmly cemented, smoothly finished; aperture, a simple curved slit at the base of the last-formed chamber. Diameter, 0.55 mm.

Specimens occurred at the following stations: Guide 9, 13.

Haplophragmoides sphaeriloculum Cushman

Haplophragmoides sphaeriloculum Cushman, U. S. Nat. Mus., Bull. 71, pt. 1, 1910, p. 107, fig. 165; Proc. U. S. Nat. Mus., vol. 51, 1917, p. 652; U. S. Nat. Mus., Bull. 104, pt. 2, 1920, p. 44, pl. 8, fig. 3; Bull. 100, vol. 4, 1921, p. 83, pl. 15, fig. 3; Carnegie Inst., Publ. 342, 1924, p. 11, pl. 1, fig. 2.

Haplophragmium sphaeriloculum Sidebottom, Jour. Roy. Micr. Soc., 1918, p. 15, pl. 2, figs. 15, 16.

Test free, planospiral, five or six chambers in the last-formed coil, partially involute; periphery deeply lobulated; chambers inflated; sutures depressed; wall finely arenaceous, smoothly cemented; aperture a short, narrow slit at the base of the final chamber; color, light yellowish-brown. Diameter, about 0.45 mm.

The only record for this species is Guide station 22.

The species is known from widely separated stations in the Pacific region and a few in the western Atlantic.

Haplophragmoides advena Cushman

Haplophragmoides advena Cushman, Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 2, 1925, p. 38, pl. 6, figs. 1*a*, *b*.

Test compressed, involute, close-coiled, umbilicate; periphery broadly rounded; last-formed coil consisting of about ten chambers, only slightly inflated; sutures distinct, slightly depressed, very slightly curved; wall arenaceous, mostly of fine material but with numerous angular fragments; aperture a low, curved slit in the base of the apertural face. Length, up to 1.45 mm.; breadth, 1.05 mm.

The species occurred at 165 feet, one and one-half miles west of the Scripps Institution pier at La Jolla, California, and in 210 feet at a station one and one-half miles south of the pier.

Originally the species was described from Virago Sound, off British Columbia, 8–15 fathoms, and also off Queen Charlotte Island, 20–25 fathoms. The records would indicate that it occurs in comparatively shallow water off shore along the coast from British Columbia to southern California, but it was not found in any of the deeper water stations.

Haplophragmoides planissima Cushman n. sp.

Plate 1, figure 6

Test large, slightly longer than broad, much compressed, involute, close-coiled, slightly umbilicate; periphery acute; chambers and sutures indistinct; wall fragile, composed of a single layer of rather coarse, angular sand grains with a large amount of grayish-white cement, exterior rough. Maximum length, 1.5 mm.; breadth, 1.25 mm.

Holotype (U. S. Nat. Mus., No. 20289) from one and one-half miles west of Scripps Institution pier at La Jolla, California, in 165 feet. It also occurs one and one-half miles south of the pier and at the following stations: Lydonia 25, 33, 34, 35; Discoverer 3F; Scripps 1531, 1536, 1618, 1622.

The chambers and sutures are very indistinct, and the fragile condition of the wall makes the specimens break very easily, especially the last chamber. In some respects this species resembles the following.

Haplophragmoides tenuis Cushman n. sp.

Plate 1, figure 5

Test planospiral, close-coiled, compressed, involute, umbilicate; periphery rounded; chambers few, usually six in the last-formed coil, sutures radial, distinct, slightly depressed; wall very thin, composed of fine quartz grains with grayish cement giving a translucent appearance, smoothly finished; aperture, a curved slit at the base of the apertural face. Lenth 0.45 mm.; breadth, 0.35 mm.

Holotype (U. S. Nat. Mus., No. 20290) from Guide station 4(24), Lat. 43° 08′ N, Long. 124° 55′ W; 385 fathoms. It also occurred at the following stations: Guide 31(24) and Lydonia 7.

This is a very neatly built test, smoothly finished and with a very thin wall.

Subfamily LITUOLINAE

Genus **Cyclammina** H. B. Brady, 1876

Cyclammina cancellata H. B. Brady

"Nautiloid *Lituola*" W. B. Carpenter, The Microscope, ed. 5, 1875, p. 536, figs. 274*a–c*.

Cyclammina cancellata H. B. Brady, (MS.) *in* Norman, Proc. Roy. Soc., vol. 25, 1876, p. 214; Cushman, U. S. Nat. Mus., Bull. 104, pt. 2, 1920, p. 53, pl. 10, figs. 4, 5.

Test large, compressed, planospiral, composed of two or three coils; periphery broadly rounded, smooth or slightly lobulated; umbilical region depressed; chambers numerous, fifteen or more in the last-formed coil, sutures sigmoid, distinct, labyrinthic within, especially toward the periphery; wall arenaceous with much cement, smoothly finished; aperture, an elongate, curved slit at the base of the apertural face, usually with supplementary pores in the middle of the face.

The specimens in this collection are few and apparently young. The supplementary pores of the apertural face are not developed and the test is white. The chambers are labyrinthic and the general appearance is that of the young of *C. cancellata*.

Family TEXTULARIIDAE

Subfamily TEXTULARIINAE

Genus **Textularia** Defrance, 1824

Textularia cf. **abbreviata** d'Orbigny

Test short and broad, compressed; periphery acute, broadening rapidly from the pointed initial end giving a broadly triangular form in front view; chambers few, not inflated; sutures distinct, only slightly depressed; wall coarsely arenaceous but smoothly finished, apertural end flattened or even slightly concave; aperture, a narrow slit at the inner margin of the chamber. Length, up to 0.90 mm.

This species occurred at the following stations: Scripps 1530, 1531, 1622, and one and one-half miles west of the pier at La Jolla. It is the only species of this genus in the collections.

Family VERNEUILINIDAE

Genus **Verneuilina** d'Orbigny, 1840

Verneuilina scabra (Williamson)

Bulimina scabra Williamson, Rec. Foram. Great Britain, 1858, p. 65, pl. 5, figs. 136, 137 (*B. arenacea* on explanation of plate).

Verneuilina scabra Cushman, U. S. Nat. Mus., Bull. 104, pt. 3, 1922, p. 55.

Test elongate, tapering, triserial, the apical end bluntly rounded; chambers comparatively few, inflated; sutures distinct, depressed; wall coarsely arenaceous, surface slightly roughened; aperture oval, at the base of the inner margin of the last-formed chamber, in a depression formed at the junction of the three last-formed chambers; color, reddish-brown. Length, up to 1.5 mm.

The records are from the following stations: Guide 9, 13, 15, 18; Lydonia 33; Scripps 1618.

The specimens are very simliar to those from the Atlantic coast. The name *V. polystropha* has been applied to such forms, but Williamson's earlier name takes precedence.

Verneuilina advena Cushman

Verneuilina polystropha Heron-Allen and Earland (not Reuss), minute form, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 55 (in part), pl. 4, figs. 3–5 (not 1, 2).

Verneuilina advena Cushman, Res. Hudson Bay Exped., 1920, No. 9, 1922, p. 9; U. S. Nat. Mus., Bull. 104, pt. 3, 1922, p. 57, pl. 9, figs. 7–9.

Test elongate, tapering, triserial, small and slender; chambers fairly numerous, distinct, somewhat inflated; sutures distinct and depressed; aperture in the terminal depression. Length, 0.20 mm.

The only record for this species is Guide station 7(24). This is in the most northern of the groups of stations and fits well with the previously known records for this small species, all of which are from comparatively cold waters.

Verneuilina bradyi Cushman

Verneuilina pygmaea H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 385, pl. 47, figs. 4–7 (not *Bulimina pygmaea* Egger).

Verneuilina bradyi Cushman, U. S. Nat. Mus., Bull. 71, pt. 2, 1911, p. 54, figs. 87*a*, *b*; Bull. 104, pt. 3, 1922, p. 59, pl. 11, fig. 1.

Test pyramidal, the triserial chambers inflated; wall finely arenaceous; about five visible chambers in each vertical series; surface smooth, but not usually polished; aperture an elongate slit near the base of the inner margin of the chamber, occasionally with a lip; color, light gray. Length, 0.50 mm.

The few specimens of this species are typical but are evidently not fully grown. They occurred at the following stations: Guide 2, 3; Lydonia 9(22).

Genus **Gaudryina** d'Orbigny, 1839

Gaudryina triangularis Cushman

Gaudryina triangularis Cushman, U. S. Nat. Mus., Bull. 71, pt. 2, 1911, p. 65, figs. 104*a–c*; Bull. 103, 1918, p. 56, pl. 20, fig. 3; Proc. U. S. Nat. Mus., vol. 56, 1919, p. 604; Carnegie Inst., Publ. 291, 1919, p. 35; U. S. Nat. Mus., Bull. 100, vol. 4, 1921, p. 148; U. S. Geol. Surv., Prof. Paper 129F, 1922, p. 127; 133, 1923, p. 21, pl. 3, fig. 5.

Test slightly longer than broad, for the most part triangular, the angles subacute, early chambers triserially arranged, later ones biserial, few; wall coarsely arenaceous, smoothly finished; aperture a narrow slit at the inner margin of the last-formed chamber. Length, up to 1 mm.

All the records from these collections are from comparatively shallow water as follows: Discoverer 13N; Scripps 1530, 1531, 1534, 1622. The species was originally described from the Pacific and has been found fossil in the later Tertiary of America.

Genus **Clavulina** d'Orbigny, 1826

Clavulina communis d'Orbigny

Clavulina communis d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 268, Foram. Bass. Tert. Vienne, 1846, p. 196, pl. 12, figs. 1, 2; Cushman, U. S. Nat. Mus., Bull. 104, pt. 3, 1922, p. 84, pl. 16, figs. 4, 5.

Test elongate, subcylindrical, broadest near the initial end, early portion triserial, later and in the adult the larger portion uniserial, circular in transverse section; chambers numerous, early ones indistinct, later ones distinct; sutures distinct except in the triserial young stages; wall arenaceous, generally smooth; aperture in the early portion verneuiline, later becoming rounded, terminal with a slight neck.

Specimens referred to the typical form of the species occurred at the following stations: Lydonia 9, 12.

There is a much coarser, larger variety at Guide 2, 3, and Lydonia 3, 12.

Clavulina communis d'Orbigny var. **pallida** Cushman n. var.

Plate 2, figure 1

Test differing from the type in the more slender form and the character of the wall which is of fine material, chalky white in color, the sutures throughout distinct and depressed.

Holotype (U. S. Nat. Mus., No. 20291) from Guide station 16, Lat. 33° 25′ N, Long. 118° 18′ W, 465 fathoms. It also occurs at the following stations: Guide 21; Lydonia 25, 27, 34, 35; Discoverer 9D, 17F, 4Q; Scripps 1618.

This is the variety figured by Flint (Ann. Rept. U. S. Nat. Mus., 1897 (1899), p. 288, pl. 34, fig. 3). It is so far as observed a variety of warmer waters than is the more typical form.

Family MILIOLIDAE

Genus **Quinqueloculina** d'Orbigny, 1826

Quinqueloculina sp. (?)

The only specimens in the collection belonging to this genus are from Guide station 3. They are not well preserved and are too few for specific determination.

Genus **Sigmoilina** Schlumberger, 1887

Sigmoilina tenuis (Czjzek)

Quinqueloculina tenuis Czjzek, Haidinger's Nat. Abhandl., vol. 2, 1847, p. 149, pl. 13, figs. 31–34.

Spiroloculina tenuis H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 152, pl. 10, figs. 7–11.

Sigmoilina tenuis Chaster, First Rept. Southport Soc. Nat. Sci., 1890–91 (1892), p. 56; Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 464; Jones, Foram. Crag, pt. 2, 1895, p. 125, pl. 7, fig. 2; Millett, Jour. Roy. Micr. Soc., 1904, p. 607; Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 48, 1904, p. 6; Millett, Rec. Foram. Galway, 1908, p. 5, pl. 1, fig. 3; Bagg, U. S. Geol. Surv., Bull. 513, 1912, p. 33, pl. 8, figs. 9*a–f*; Halkyard, Mem. Proc. Manchester Lit. Philos. Soc., vol. 62, pt. 2, 1918 (1919), p. 14; Cushman, U. S. Nat. Mus., Bull. 103, 1918, p. 81, pl. 31, figs. 4 *a–c*.

Test sigmoid, longer than broad, compressed, five or six chambers visible on either side; narrow, rounded in transverse section; wall smooth; aperture with a slight neck, rounded.

The species occurs at the following stations: Guide 1, 5, 13; Lydonia 8, 35.

Genus **Triloculina** d'Orbigny, 1826

Triloculina tricarinata d'Orbigny

Triloculina tricarinata d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 299; Modèles, No. 94; Cushman, U. S. Nat. Mus., Bull. 71, pt. 6, 1917, p. 66, pl. 25, figs. 1, 2; fig. 32.

Test in the adult with three visible chambers, smooth, sharply angled, almost carinate, whole test somewhat longer than wide, in end view triangular, sides straight; aperture typically with a narrow, bifid tooth.

The only specimen in the collections is from Lydonia station 18.

From Scripps station 1530 there are a very few specimens that have the peripheral face of the chambers slightly convex and the angles less sharp.

Genus **Biloculina** d'Orbigny, 1826

Biloculina depressa d'Orbigny

Plate 2, figure 2

Biloculina depressa d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 298; Modèles, No. 91; Cushman, U. S. Nat. Mus., Bull. 71, pt. 6, 1917, p. 74, pl. 28, figs. 1, 2.

Test in front view nearly circular, compressed; periphery carinate, median portion rotund, in end view ellipsoid; wall smooth, dull white; aperture broad, without a neck, the tooth at the ventral side, wide, nearly as long as the aperture. Diameter, up to 1 mm.

Specimens occurred at the following stations: Guide 3, 4(24), 5, 12, 15, 17(24), 21, 22; Lydonia 35; Scripps 1632.

Biloculina murrhyna Schwager

Biloculina murrhyna Schwager, Novara Exped., Geol. Theil, vol. 2, 1866, p. 203, pl. 4, figs. 15*a–c*; Cushman, U. S. Nat. Mus., Bull. 71, pt. 6, 1917, p. 75, pl. 28, fig. 3; pl. 29, fig. 1.

Test, front view in young specimens nearly circular, in adult longer than broad; end view in young specimens ellipsoid, carinate, the carina interrupted at a point opposite the aperture, leaving a sinus, deep and with a long spine at each angle; in adults sinus less deep and spines reduced or wanting; aperture in the young with a neck but not projecting; in adults with a prominently exserted tubular neck and bifid tooth, wall smooth.

Specimens of this species occurred at the following stations: Guide 2 and Lydonia 3.

Biloculina serrata L. W. Bailey

Plate 2, figure 3

Biloculina serrata L. W. Bailey, Boston Jour. Nat. Hist., vol. 7, 1862, p. 350, pl. 8, fig. E; Cushman, U. S. Nat. Mus., Bull. 71, pt. 6, 1917, p. 75, pl. 29, fig. 2.

Test in front view nearly circular, central portion tumid, compressed gradually toward the periphery forming a deeply serrate carina, the middle of the margin opposite the aperture with a deep reentrant serration less deep toward the apertural end; wall smooth, polished; aperture subcircular, with a narrow neck not produced, tooth strongly bifid.

Biloculina serrata occurred at the following stations: Guide 3; Lydonia 3, 12, 25, 35.

Biloculina elongata d'Orbigny

Biloculina elongata d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 298; H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 144, pl. 2, fig. 9; Cushman, U. S. Nat. Mus., Bull. 71, pt. 6, 1917, p. 78, pl. 31, fig. 1; fig. 40.

Test elongate, pyriform, tapering gradually toward the apertural end, somewhat rounded truncate at the opposite end, in end view chambers well rounded; periphery rounded; suture depressed; wall smooth; aperture elliptical with a small, flattened, somewhat rounded tooth.

The only specimen of this species in the collection is from Lydonia station 8. It is not so elongate as is usual in this species.

Biloculina lucernula Schwager

Biloculina lucernula Schwager, Novara Exped., Geol. Theil., vol. 2, 1866, p. 202, pl. 4, figs. 14*a–c*, 17*a–b*; Cushman, U. S. Nat. Mus., Bull. 71, pt. 6, 1917, p. 79, pl. 32, fig. 2.

Test in front view nearly circular, ends somewhat projecting; chambers in end view well curved; periphery bluntly angled; wall often with a fine coating of arenaceous material; aperture exserted with a short cylindrical neck and small tooth.

The only specimens referable to this species are from Lydonia station 10. They are not well preserved.

Family TROCHAMMINIDAE

Subfamily TROCHAMMININAE

Genus **Trochammina** Parker and Jones, 1860

Trochammina globigeriniformis (Parker and Jones)

Globigerina bulloides Williamson, Rec. Foram. Great Britain, 1858, p. 56, pl. 5, figs. 116–118 (not *G. bulloides* d'Orbigny, 1828).

Lituola nautiloidea var. *globigeriniformis* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 407, pl. 15, figs. 46, 47.

Trochammina globigeriniformis Cushman, U. S. Nat. Mus., Bull. 71, pt. 1, 1910, p. 124, figs. 193–195; Bull. 104, pt. 2, 1920, p. 78, pl. 16, figs. 5, 6.

Test trochoid, spire varying in height, usually wider than high; chambers globose, sutures deeply depressed, last-formed coil usually with three to five chambers, rapidly increasing in size as added; wall of sand grains with reddish-brown or gray cement, smoothly finished. Diameter, up to 1 mm.

Specimens occurred at Lydonia stations 7, 10, 12, 22. It is a widely distributed species.

Trochammina turbinata (H. B. Brady)

Haplophragmium turbinatum H. B. Brady, Quart. Jour. Micr. Sci., vol. 21, 1881, p. 50; Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 312, pl. 35, figs. 9*a–c*.

Trochammina turbinatum Eimer and Fickert, Zeitschr. Wiss. Zool., vol. 65, 1899, p. 695; Cushman, U. S. Nat. Mus., Bull. 104, pt. 2, 1920, p. 81, pl. 17, fig. 2.

Test spiral, early portion regular, low spired, last-formed whorl in the adult often becoming oblique; chambers 5–8 in the last whorl, umbilicate; wall arenaceous, usually smoothly finished, cement yellowish-brown; aperture a narrow slit at the base of the ventral side of the chamber.

Specimens occurred rarely at the following stations: Guide 2; Lydonia 17, 34. None were fully developed.

Trochammina pacifica Cushman

Trochammina pacifica Cushman, Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 2, 1925, p. 39, pl. 6, figs. 3*a–c*.

Test small, trochoid, composed of several coils, four to five chambers in the last-formed one, ventrally umbilicate; periphery rounded; sutures distinct, slightly depressed, nearly radial; wall finely arenaceous, smoothly finished; aperture a narrow slit at the base of the ventral face of the last-formed chamber. Diameter, 0.45 mm.

The only specimens are from Scripps station 1622. This is the same as the species originally described from British Columbia, Virago and Queen Charlotte sounds, in 8–25 fathoms. It is worth noting that station 1622 is in 80 meters, showing that this species is probably widely distributed along the eastern coast of the north Pacific in comparatively shallow water.

Genus **Nouria** Heron-Allen and Earland, 1914

Nouria polymorphinoides Heron-Allen and Earland, 1914

Nouria polymorphinoides Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1914, p. 376, pl. 37, figs. 1–15; Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 601; Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 103.

A specimen from Discoverer station 42M has the characters of this species. The wall is of coarse, neatly cemented, transparent grains with a gray cement. The exterior seems to indicate more than one chamber but the interior is undivided.

Family LAGENIDAE

Subfamily NODOSARIINAE

Genus **Cristellaria** Lamarck 1812

Cristellaria cf. **convergens** Bornemann

A single specimen from Guide station 5 resembles this species somewhat but the test is less compressed than the typical form.

Genus **Robulus** Montfort, 1808

Robulus cultratus Montfort

Very many forms have been referred to this species and if possible an attempt should be made to establish the characters of the type if it is extant. The specimens in the present collection referred to here have a keel and a broad triangular apertural face with the somewhat enlarged slit from the aperture. It occurs at Guide station 14.

Genus **Nodosaria** Lamarck, 1812

Nodosaria pyrula d'Orbigny

"Orthoceras Monile" Soldani, Testaceographia, vol. 2, 1798, p. 35, pl. 10, figs. *b*, *c*.

Nodosaria pyrula d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 253; Williamson, Rec. Foram. Great Britain, 1858, p. 17, pl. 2, fig. 39; Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 69, pl. 16, figs. 1–4.

Test elongate, slender, composed of numerous chambers, either in a straight or slightly curved line, pyriform in shape with long tapering necks; surface smooth.

There is a single specimen from Lydonia station 27 which may be referred to this species. The chambers are not as widely separated as is often the case, but in the absence of more material it may be left here.

Genus **Glandulina** d'Orbigny, 1826

Glandulina laevigata d'Orbigny

"Cornu Hammonis erectum globosius" Plancus, Conch. Min., 1739, p. 16, pl. 13, fig. 1.

Nodosaria (*Glandulina*) *laevigata* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 252, pl. 10, figs. 1–3; Cushman, U. S. Nat. Mus., Bull. 71, pt. 3, 1913, p. 47, pl. 24, figs. 1, 2.

Glandulina laevigata d'Orbigny, Foram. Foss. Bass. Tert. Vienne, 1846, p. 29, pl. 1, figs. 4, 5.

Test fusiform, broad in the middle, tapering rapidly toward either end; apical end usually with one or more spines; chambers few, embracing, the last-formed one making up two-thirds or more of the visible test; sutures flush, but distinct; wall smooth; aperture radiate. Length, slightly more than 1 mm.

The only specimens in the collection are from Lydonia station 27.

Subfamily LAGENINAE

Genus **Lagena** Walker and Jacob, 1798

Lagena gracillima (Seguenza)

Amphorina gracillima Seguenza, Foram. Mon. Mioc. Messina, 1862, p. 51, pl. 1, fig. 37.

Lagena gracillima Jones, Parker and H. B. Brady, Pal. Soc. Mon., vol. 19, 1866, p. 45, pl. 1, figs. 36, 37; Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 23, pl. 4, fig. 5.

Test elongate, fusiform, the apertural end tapering into a long cylindrical neck with a phialine lip, the opposite end much elongated, ending in a point, closed; surface smooth, wall translucent. Length of incomplete specimens slightly more than 1 mm.

Single specimens occurred at the following stations: Guide 21 (24), 31 (24); Lydonia 9, 34, 35.

Lagena elongata (Ehrenberg)

Miliola elongata Ehrenberg, Bericht. preuss. Akad. Wiss. Berlin, 1844, p. 274; 1845, p. 371; Mikrogeologie, 1854, pl. 25, fig. 1,

Lagena elongata Tate and Blake, Yorkshire Lias, 1876, p. 454, pl. 18, figs. 9, 9*a*; Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 15, pl. 3, fig. 4.

Test elongate, slender, the central portion subcylindrical, the ends rather tapering, apertural end with a slightly thickened lip, opposite end closed; wall translucent, smooth. Specimens slightly more than 1 mm. in length.

There are single specimens from the following stations: Guide 16, 17, 21 (24); Lydonia 10.

There is some variation in the size and shape but in general the sides in the central portion are parallel or nearly so.

Lagena gracilis Williamson

Lagena gracilis Williamson, Ann. Mag. Nat. Hist., ser. 2, vol. 1, 1848, p. 13, pl. 1, figs. 3, 4; Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 22, pl. 4, figs. 3, 4.

Test elongate, fusiform, broadest in the middle, apertural end tapering into a long, cylindrical neck with a slightly expanded lip, opposite end pointed; surface ornamented by a few distinct, longitudinal costae.

Specimens occurred at the following stations: Guide 29 (24), 32 (24); Lydonia 35. The specimen from the last station has the costae thin and raised.

Lagena hexagona (Williamson) var. **scalariformis** (Williamson)

Entosolenia squamosa (Montagu) var. *scalariformis* Williamson, Rec. Foram. Great Britain, 1858, p. 13, pl. 1, fig. 30.

Lagena scalariformis Reuss, Sitz. Akad. Wiss. Wien., vol. 46, pt. 1, 1862 (1863), p. 333, pl. 5, figs. 69–71.

Lagena hexagona (Williamson) var. *scalariformis* (Williamson), Cushman, U. S. Nat. Mus., Bull. 71, pt. 3, 1913, p. 17, pl. 6, fig. 4.

Test subglobular, surface ornamentation of a generally reticulate pattern, the sides of the reticulations thickened forming costae, the top and bottom borders less conspicuous.

The only specimens are from Scripps station 1530. It has previously been recorded from the Pacific.

Lagena lagenoides (Williamson) trigonal form

A single specimen from Lydonia station 3 has the general characters of this species, but the ornamentation is trigonal. There are three longitudinal plates equidistant on the surface with the characteristic radiating tubulations.

Lagena substriata Williamson

Lagena substriata Williamson, Ann. Mag. Nat. Hist., ser. 2, vol. 1, 1848, p. 15, pl. 1, fig. 12; Cushman, U S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 56, pl. 10, fig. 11.

Lagena vulgaris Williamson var. *substriata* Williamson, Rec. Foram. Great Britain, 1858, p. 7, pl. 1, fig. 14.

Test elongate, body of the test longer than broad, basal end rounded, apertural end tapering into an elongate neck; wall ornamented with numerous fine longitudinal costae, as many as 50 or 60 in number, running from the base of the chamber to the base of the neck. Length, up to 0.50 mm.

Specimens occurred at the following stations: Guide 6 (24), 24 (24), 26 (24), 32 (24); Lydonia 35.

The body of the test in most of these specimens is more nearly spherical than usual but the ornamentation is typical.

Lagena sulcata (Walker and Jacob)

"Serpula (Lagena) striata sulcata rotundata" Walker and Boys, Test. Min., 1784, p. 2, pl. 1, fig. 6.

Serpula (Lagena) sulcata Walker and Jacob, Adam's Essays, Kanmacher's ed., 1798, p. 634, pl. 14, fig. 5.

Lagena sulcata Parker and Jones, Philos. Trans., vol. 155, 1865, p. 351; Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 57, pl. 11, fig. 1.

Test typically subglobose, slightly longer than broad; wall with numerous longitudinal costae, 14–18 in number, neck elongate, often with spiral costae.

The only specimens are from Guide stations 1 and 3.

Lagena acuticosta Reuss

Lagena acuticosta Reuss, Sitz. Akad. Wiss. Wien, vol. 44, pt. 1, 1861 (1862), p. 305, pl. 1, fig. 4; Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 5, pl. 1, figs. 1–3.

Test subglobular to pyriform, broadest near the broadly rounded base, apertural end tapering; ornamentation consisting of several longitudinal plate-like costae.

A single specimen from Guide station 1 may be referred to this species.

Lagena williamsoni (Alcock)

Entosolenia williamsoni Alcock, Proc. Lit. Philos. Soc., vol. 4, 1865, p. 193.
Lagena williamsoni Wright, Proc. Belfast Nat. Field Club, 1876–77; App. 4, p. 104, pl. 4, fig. 14; Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 61, pl. 11, figs. 8, 9.

Test similar to *L. acuticosta* but with the costae coalescing at the upper end and forming a collar made up of a reticulate network below the aperture.

The only record in the collection is from Guide station 21. The peculiar collar is typically developed.

Lagena alveolata H. B. Brady var. **plebeia** Cushman

Lagena alveolata H. B. Brady var. *plebeia* Cushman, U. S. Nat. Mus., Bull. 71, pt. 3, 1913, p. 33, pl. 18, fig. 2.

Test larger than the type, coarser, opaque; wall thick, the keels separated, forming two gaping depressions at either side of the median keel; margins roughened. Length, up to 0.85 mm.

The only specimens are from Guide station 3, but they are typical. This variety was originally described from the north Pacific, and seems to be limited, so far as is known, to this region.

Lagena orbignyana (Seguenza) var. **elliptica** Cushman

Lagena orbignyana (Seguenza) var. *elliptica* Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 42, pl. 6, figs. 10–12.

From Guide station 3 and Lydonia station 17 there are specimens which very strongly resemble this variety described from the Caribbean.

Lagena hertwigiana H. B. Brady var. **undulata** Sidebottom

Lagena hertwigiana H. B. Brady var. *undulata* Sidebottom, Jour. Quekett Micr. Club, vol. 11, 1912, p. 397, pl. 16, figs. 26–28.

Test ovate or pyriform, circular in section with a long neck; body of the test ornamented with longitudinal ridges with a single row of perforations between; wall compound and cellular.

Sidebottom described this variety from the southwest Pacific. A rather typical specimen is from Guide station 17.

Lagena lamellata Sidebottom

Lagena lamellata Sidebottom, Jour. Quekett Micr. Club, vol. 11, 1912, p. 396, pl. 16, figs. 24, 25.

Test somewhat pyriform with a slender neck, base broadly rounded; wall compound, surface of thin polygonal flakes supported by a spinose structure beneath and separating it from the main wall of the test.

The types are from the southwest Pacific. Specimens which seem to belong to this species occur at the following stations: Guide 24 (24); Lydonia 9, 27; Scripps 1632. Fractured portions of the surface show the peculiar structure described by Sidebottom, and in one specimen the outer thin wall is almost entirely gone leaving a hispid surface.

Lagena hispida Reuss

Lagena hispida Reuss, Zeitschr. deutsch. geol. Ges., vol. 10, 1858, p. 43; Sitz. Akad. Wiss. Wien, vol. 46, pt. 1, 1862 (1863), p. 335, pl. 6, figs. 77–79; Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 26, pl. 4, figs. 7, 8.

There is a single broken specimen of globular shape and with very distinct spines that may be assigned to this species. It is from Guide station 5.

Lagena sacculus Fornasini

Lagena acuta H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 474, pl. 59, figs. 6*a*, *b* (not *L. acuta* [Reuss]).

Lagena sacculus Fornasini, Mem. Accad. Sci. Ist. Bologna, ser. 5, vol. 9, 1901, p. 49, fig. 3.

There are specimens from Guide stations 2 and 3 which have the form of this species and the carinate border. They are close to the typical form as figured by Fornasini.

Family NONIONIDAE

Genus **Nonion** Montfort, 1808

Nonion cf. **scapha** (Fichtel and Moll)

There are a very few specimens similar to that figured which may probably be referred to Fichtel and Moll's species. They show very little variation, and are distinct from the other species found in the region. They are from Guide station 17 (24) and Scripps 1530.

Nonion cf. **punctata** (d'Orbigny)

Plate 2, figure 6

In his South American Memoir d'Orbigny describes this species and notes its resemblance to *N. grateloupi* d'Orbigny of the West Indian region except that *N. punctata,* among other characters, has a convex apertural face. The specimens in this collection agree in this particular, but none of them have the last-formed chamber so prolonged. In some respects, these recent specimens are close to the species of the California Miocene that I have described as *Nonion medio-costata* (Cushman, Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 4, 1926, p. 89, pl. 13, figs. 1*a–c*). Specimens occurred at the following stations: Guide 7(24), 30(24), 32(24), and Scripps 1530. There is very little variation in the general characters.

Nonion labradorica (Dawson)

Plate 2, figures 7, 8

Nonionina scapha (Fichtel and Moll) var. *labradorica* Dawson, Can. Nat. vol. 5, 1870, p. 177, fig. 5; Am. Jour. Sci., ser. 3, vol. 1, 1871, p. 206, fig. 5; Ann. Mag. Nat. Hist., ser. 4, vol. 7, 1871, p. 86, fig. 5; Can. Nat., vol. 6, 1872, p. 255, pl. 3, fig. 4.

Test with the chambers in the adult rapidly increasing in breadth, especially toward the base where the whole chamber extends out laterally forming a broadly triangular apertural face, whole test small and of few chambers. Length, 0.45 mm; breadth, 0.30 mm.; thickness, 0.30 mm.

This is the most common species in the collection, occurring at the following stations: Guide 6(24), 7(24), 17(24), 26(24), 29(24), 30(24), 32(24); Lydonia 30; Discoverer 27N, 4Q. It occurs, as will be seen by the station data, almost entirely from the colder waters. It was originally described by Dawson from the cold waters of the Atlantic coast of Canada, and it occurs in the colder parts of the north Atlantic.

Nonion umbilicatula (Montagu)

Plate 2, figure 4

There are a few specimens similar to that figured which show the broad test which seems to be typical of this species. It is rare and occurs at the following stations: Guide 2, 3; Lydonia 18. The following variety is more common.

Nonion umbilicatula (Montagu) var. **pacifica** (Cushman)

Plate 2, figure 5

Nonionina umbilicatula (Montagu) var. *pacifica* Cushman, Carnegie Inst., Publ. 342, 1924, p. 48, pl. 16, fig. 3.

Test much more compressed than in the type, the sutures distinct but not usually limbate; wall finely and evenly punctate.

The types of this variety are from Samoa. The specimens in the present collection are of the same general form, but there is a tendency in some of them toward slightly limbate sutures. The general form of the test is similar to that of the types, however. Specimens occurred at the following stations: Guide 1, 2, 3, 12, 16, 20, 21; Lydonia 8, 10, 25, 27, 33, 35.

Genus **Nonionella** Cushman, 1926

Nonionella miocenica Cushman

Nonionina auris Cushman (not d'Orbigny), Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 4, 1926, p. 91, pl. 13, figs. 4*a–c*.

Nonionella miocenica Cushman, *op. cit.*, vol. 2, pt. 3, 1926, p. 64.

Test subtrochoid, small; periphery broadly rounded, 8–10 chambers or less in the last-formed coil, distinct, dorsal side not completely involute; sutures obliquely curved, the last chambers with the umbilical end forming a distinct rounded lobe; wall smooth; aperture low, elongate.

The species occurs at Guide station 31 (24) and is almost exactly like the Miocene forms from the coast of the same general region. No specimens with the character of *N. auris* d'Orbigny were found.

Family BULIMINIDAE

Subfamily TURRILININAE

Genus **Buliminella** Cushman, 1911

Buliminella subfusiformis Cushman var. **tenuata** Cushman n. var.

Plate 2, figure 9

Test more elongate and slender than the type, chambers somewhat more elongate, the apertural end pointed.

Holotype (U. S. Nat. Mus., No. 20292) from Guide station 13, Lat. 33° 17′ N, Long. 117° 55′ W; 396 fathoms. The variety also occurs at the following stations: Guide 4 (24), 8, 12, 13, 16, 17, 21 (24), 22 (24), 36 (24); Lydonia 27, 30; Discoverer 9E, 27N. This is one of the characteristic forms especially in the northern portion of the area covered by the collection.

Subfamily Buliminiinae

Genus **Bulimina** d'Orbigny, 1826

Bulimina ovula d'Orbigny

Plate 2, figure 10

Bulimina ovula d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, Foraminifères, p. 51, pl. 1, figs. 10, 11.

Test broadly fusiform, initial end pointed, the first few chambers in a short spire, later ones extending backward leaving only the early portion of the test exposed; wall smooth, distinctly perforate; aperture large.

D'Orbigny originally described this species in his South American monograph and it has been seldom referred to since. Much of the material in the present collection fits d'Orbigny's species very closely. It occurred at the following stations: Guide 4 (24), 12, 13, 15 (24), 17, 21 (24), 31 (24); Discoverer 27N, 42M; Scripps 1622.

Bulimina ovata d'Orbigny

Bulimina ovata d'Orbigny, Foram. Foss. Bass. Tert. Vienne, 1846, p. 185, pl. 11, figs. 13, 14.

Test fusiform, rounded at both ends in the megalospheric form, more pointed in the microspheric; chambers distinct, extending back, and the last-formed ones covering the upper half of the test; sutures distinct, slightly depressed; wall smooth, finely perforate; aperture usually with a distinct tooth and often with a slight lip.

Bulimina ovata is one of the common species in the collection, occurring at the following stations: Guide 7 (24), 8, 12, 16, 16 (24), 17, 21, 21 (24), 22 (24), 26 (24), 30 (24), 32 (24); Lydonia 9, 26, 27, 34; Discoverer 9D, 16E, 10F, 13N.

Bulimina affinis d'Orbigny

Bulimina affinis d'Orbigny, *in* De la Sagra, Hist. Fis. Pol. Nat., Cuba, 1839, Foraminifères, p. 105, pl. 2, figs. 25, 26.

Test, at least in the microscopic form, tapering, apical end pointed, greatest breadth toward the apertural end, the last-formed whorl of chambers occupying the upper third or more of the test; wall smooth; sutures distinct but not depressed.

There are numerous specimens which in the microspheric form are tapering and resemble d'Orbigny's species. They occur at numerous stations but in the megalospheric form are difficult to distinguish from *B. ovata*. Specimens occur at the following stations: Guide 5, 10, 12, 13, 14, 16 (24), 20, 22; Lydonia 4, 9, 10, 25, 34.

Bulimina spinifera Cushman n. sp.

Plate 2, figure 15

Test broadly fusiform or ovate, chambers of the last-formed portion strongly overlapping, initial end pointed and the base of the chambers sparsely spinose. Length, 0.50 mm.; breadth, 0.30 mm.

Holotype (U. S. Nat. Mus., No. 20293) from Lydonia station 31. Lat. 7° N, Long. 8° 35.5′ W; 478 fathoms. The species also occurs at the following stations: Guide 1, 8, 20, 21; Lydonia 30. None of the other species in this region seem to have developed this sparsely spinose character. It is distinct from the following very spinose species.

Bulimina barbata Cushman n. sp.

Plate 2, figure 11

Test broadly oval in side view, the greatest breadth at or below the middle; sutures distinct, slightly depressed; the last-formed chamber extending about half way back on the test; early portion clothed with fine acicular spines, later portion entirely smooth. Length, 0.75 mm.; breadth, 0.40 mm.

Holotype (U. S. Nat. Mus., No. 20294) from Discoverer station 9D, Lat. 36° 40′ N, Long. 122° 26′ W; 1121 fathoms. It also occurs at the following stations: Guide 3, 5, 13, 15, 18; Lydonia 3; Discoverer 10E, 11G, 12G, 4Q; Scripps 1619.

This species in some respects resembles the much more coarsely ornamented *Bulimina inflata* Seguenza, but does not have either the shape, thick wall, costae, or stout spines of that form. The two have not usually been found together in the collection.

Bulimina inflata Seguenza

Plate 2, figure 14

Bulimina inflata Seguenza, Atti Accad. Gioenia Sci. Nat., ser. 2, vol. 18, 1862, p. 109, pl. 1, fig. 10; Cushman, U. S. Nat. Mus., Bull. 104, pt. 3, 1922, p. 93, pl. 21, fig. 1.

Test short, broadest usually above the middle; sutures much depressed; chambers overhanging at the basal edge; upper portion of the test smooth, lower portion with distinct costae growing in thickness toward the basal margin and there ending in stout spines; apical end usually with a stout acicular spine; wall thick opaque in the adult.

Bulimina inflata is one of the characteristic species in the collection, occurring at the following stations: Guide 1, 3, 5, 22 (24); Lydonia 3, 9, 10, 12, 25, 27, 33, 34, 35; Discoverer 9D, 6G, 42M.

Bulimina rostrata H. B. Brady

Plate 2, figure 12

Bulimina rostrata H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 408, pl. 51, figs. 14, 15; Cushman, U. S Nat Mus., Bull. 104, pt. 3, 1922, p. 99.

Test small, ovoid, tapering to a point at the initial end, sometimes ending in a distinct spine; chambers obscured by the ornamentation which consists of a few stout longitudinal costae running unbroken from near the apertural end to the initial end of the test.

This is typically a species of the Pacific. It occurred at the following stations: Guide 3; Lydonia 10, 12, 30.

Bulimina pulchella d'Orbigny

Plate 2, figure 13

Bulimina pulchella d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, Foraminifères, p. 50, pl. 1, figs. 6, 7.

Test elongate, tapering, greatest width near the apertural end; chambers numerous, very distinct, deeply cut under at the base and ornamented by numerous flattened spinose processes somewhat above the basal angle and parallel to it; test otherwise smooth. Length, 0.50 mm.; breadth, 0.25 mm.

The species was described by d'Orbigny from the coasts of Peru and Chile. It occurred only at Scripps stations 1534 and 1536. The species differs from its nearest relative, *Bulimina marginata* d'Orbigny, in having a longer, more slender test and the ornamentation is not a breaking up of the basal margin into teeth but is a series of flattened projections well back from and above the edge of the chamber.

Bulimina pagoda Cushman n. sp.

Plate 2, figure 16

Test tapering, broadest near the apertural end, pointed at the initial end; chambers distinct, deeply cut under at the base; periphery of the chamber with a series of large stout spines projecting outward and curving downward, several on each chamber; wall thin and translucent, otherwise smooth. Length, 0.50 mm; breadth, 0.40 mm.

Holotype (U. S. Nat. Mus., No. 20295) from Lydonia station 30, Lat. 7° 01′ N, Long. 81° 48.7′ W; 428 fathoms. At Lydonia station, which is south of Panama, this species is common. It was not found elsewhere. It is a very distinct species in the development of the somewhat hooked spines, the regular tapering character of the test, and the steep slope of the outer walls of the last-formed chambers.

Genus **Globobulimina** Cushman, 1927

Globobulimina pacifica Cushman

Plate 3, figure 1

Globobulimina pacifica Cushman, Contrib. Cushman Lab. Foram. Res., vol. 3, pt. 1, 1927, p. 67, pl. 14, fig. 12.

Test subglobular in the adult with the last three chambers making up the exterior by enclosing the preceding ones; wall very thin, finely perforate, smooth; sutures distinct; aperture loop-shaped with a slight border, a broad apertural tooth or plate and an internal spiral tube. Length, up to 1.50 mm.; breadth, 1.00 mm.

Holotype (U. S. Nat. Mus., No. 20285) from Lydonia station 21, Lat. 17° 18′ N, Long. 102° 22′ W; 1197 fathoms.

This has proved to be one of the most abundant species in the collections, occurring at more than fifty stations, most abundant northward.

The microspheric form has the chambers extending backward and enclosing the earlier ones in the early stages, but in other specimens, which may be megalospheric forms, the later chambers do not extend entirely over the earlier ones. These may not prove to be the same, but the two forms are almost always found together and are probably the ones figured from the Pacific by Brady in the "Challenger" Report, plate 50, figure 10, the microscopic form, and possibly figure 9, the megalospheric.

Subfamily Virgulininae

Genus **Virgulina** d'Orbigny, 1826

Virgulina schreibersiana Czjzek

Plate 3, figure 3

Virgulina schreibersiana Czjzek, Haidinger's Nat. Abhandl., vol. 2, 1848, p. 147, pl. 13, figs. 18–21; Cushman, U. S. Nat. Mus., Bull. 104, pt. 3, 1922, p. 117, pl. 26, fig. 6.

Test elongate, slender, tapering, the initial end pointed and usually with a spine; chambers fairly numerous, inflated, distinct, rapidly increasing in size toward the apertural end; sutures distinct and depressed; wall thin and translucent, smooth, finely perforate; aperture elongate oval, fairly large for the size of the chamber. Length, up to 0.75 mm.

This is a common form in the collection, and has a very distinctive contour and relative size of the chambers which may later prove it to be distinct from the species to which it is assigned. It occurs at the following stations: Guide 8, 12, 13, 16, 17, 18, 21, 22; Lydonia 30, 33; Discoverer 19J; Scripps 1619.

Virgulina subsquammosa Egger

Virgulina subsquammosa Egger, Neues Jahrb. für Min., 1857, p. 295, pl. 12, figs. 19–21.

There is a single specimen here figured, from Guide station 18, which seems close to this species.

Virgulina cornuta Cushman

Plate 3, figure 2

Virgulina cornuta Cushman, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 637, pl. 80, fig. 1; U. S. Nat. Mus., Bull. 100, vol. 4, 1921, p. 170, pl. 32, figs. 3–6.

Test pointed at the initial end, broadly rounded at the apertural end, whole test curved, somewhat spiral, irregularly biserial, last-formed chambers very tumid; aperture a comma-shaped opening with a slightly raised lip; wall thin, translucent, smooth. Length, 0.50 mm.

This species has been known from the western Pacific about the Philippines, but it also occurs in this eastern Pacific collection at the following stations: Guide 12, 16, 17; Lydonia 30.

Genus **Bolivina** d'Orbigny, 1839

Bolivina plicata d'Orbigny

Plate 3, figures 11, 12

Bolivina plicata d'Orbigny, Voy. Amér. Mérid., vol. 5, pt. 5, Foraminifères, 1839, p. 62, pl. 8, figs. 8, 9; Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 48; Cushman, Contrib. Cushman Lab. Foram. Res., vol. 2, pt. 2, 1926, p. 40, pl. 6, figs. 1*a*, *b*.

Test small, thick, elongate, slightly tapering; periphery and initial end broadly rounded; chambers distinct; sutures distinct, depressed, straight; wall with one or two costae on each side, usually running the entire length of the test except for the last-formed chamber, costae broad, rounded at the surface, surface and sides finely plicate; aperture usually with a lip.

D'Orbigny described this species from off Chile. It is found in the region off Panama, Lydonia station 30, and in some of the "Albatross" dredgings. It also occurs in the Tertiary of the west coast. Most of the records of this species from other parts of the world represent very different forms.

Bolivina costata d'Orbigny

Plate 3, figure 8

Bolivina costata d'Orbigny, Voy. Amér. Mérid., vol. 5, pt. 5, Foraminifères, 1839, p. 62, pl. 8, figs. 8, 9; Cushman, Contrib. Cushman Lab. Foram. Res., vol. 2, pt. 2, 1926, p. 41, pl. 6, fig. 2.

Test small, compressed, tapering; periphery rounded, initial end broadly rounded in the megalospheric form, more acute in the microspheric; chambers distinct, slightly if at all inflated; sutures distinct, oblique; wall ornamented with five to seven longitudinal costae, thin and sharp; aperture elongate, with a slight lip.

This species described by d'Orbigny from off Peru was obtained at Lydonia station 30 but not at the more northern series of stations. It occurs in the later Tertiary of the west coast.

Bolivina punctata d'Orbigny

Plate 3, figure 4

Bolivina punctata d'Orbigny, Voy. Amér. Mérid., vol. 5, pt. 5, Foraminifères, 1839, p. 63, pl. 8, figs. 10–12; Cushman, Contrib. Cushman Lab. Foram. Res., vol. 2, pt. 2, 1926, p. 43.

Test elongate, narrow, slightly tapering, compressed, composed of numerous chambers, the surface smooth, distinctly perforate; sutures only slightly depressed.

The type specimens were from the coast of Chile. Specimens very similar to the types occur on the west coast in the late Tertiary and at Guide stations 7(24) and 31(24). Many forms have been placed under this specific name which evidently have little in common with d'Orbigny's species.

Bolivina argentea Cushman

Plate 3, figure 5

Bolivina argentea Cushman, Contrib. Cushman. Lab. Foram. Res., vol. 2, pt. 2, 1926, p. 42, pl. 6, fig. 5.

Test elongate, much compressed; periphery subacute, usually not keeled, increasing in width only slightly after the first few chambers; chambers distinct, narrow in the young, much broader in the adult; sutures oblique and curved, early ones limbate, later ones thin and somewhat depressed; wall very finely perforate, smooth except for a trace of costae near the base; color light, silvery gray, polished. Length, up to 1 mm.

Holotype (U. S. Nat. Mus., No. 20281) from Lydonia station 30, Lat. 7° 01′ N, Long. 81° 48′ W; in 428 fathoms. It also occurs at a dozen or more stations in the present collection, and is one of the most abundant and characteristic species of this area.

Bolivina pseudobeyrichi Cushman

Plate 3, figure 7

Bolivina beyrichi Reuss var. *alata* Cushman (not Seguenza) U. S. Nat. Mus., Bull. 71, pt. 2, 1911, p. 35, figs. 57*a*, *b*.

Bolivina pseudobeyrichi Cushman, Contrib. Cushman Lab. Foram. Res., vol. 2, pt. 2, 1926, p. 45.

Test compressed, rather rapidly increasing in width; chambers increasing in height as added, distinct, slightly inflated; periphery distinctly keeled, but that of each chamber distinct, posterior angle produced and pointed; sutures distinct, depressed, slightly oblique, more strongly so in the earlier chambers; wall distinctly and coarsely perforate; aperture elliptical oval with a distinct raised lip.

This is also a characteristic species of the eastern Pacific as well as in the later Tertiary of the west coast.

Bolivina pygmaea H. B. Brady

Plate 3, figure 9

Bolivina pygmaea H. B. Brady, Quart. Jour. Micr. Sci., vol. 21, 1881, p. 57; Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 421, pl. 53, figs. 5, 6.

Test stout, slightly twisted; periphery broadly rounded; chambers comparatively few, distinct, later ones becoming distinctly inflated and at the outer posterior angle terminating in a distinct, short, rounded spine, early chambers smooth and more compressed; wall smooth, very finely perforate; aperture broadly oval. Length, 0.50–0.60 mm.; breadth, 0.30 mm.

It occurred at the following stations: Guide 8, 12, 13; Lydonia 27, 30; Scripps 1618. The Pacific specimens are larger and more globose than those from the Atlantic.

Bolivina subadvena Cushman

Bolivina subadvena Cushman, Contrib. Cushman Lab. Foram. Res., vol. 2, pt. 2, 1926, p. 44, pl. 6, figs. 6*a*, *b*.

Test stout, small, slightly twisted; periphery subacute; chambers distinct, usually eight to ten pairs, inflated, especially the later ones; sutures distinct, later ones depressed; wall roughened by the very coarse perforations, in some form making a fine reticulation; aperture broad, loop-shaped, subterminal.

This is a variable species. The typical form occurs in the Pliocene of California and in the waters of the eastern Pacific at numerous stations.

Bolivina subadvena Cushman var. **spissa** Cushman

Plate 3, figure 10

Bolivina subadvena Cushman var. *spissa* Cushman, Contrib. Cushman Lab. Foram. Res., vol. 2, pt. 2, 1926, p. 45, pl. 6, figs. 8*a*, *b*.

Variety differing from the typical in having the sutures distinctly limbate and the test thickened along the median portion; periphery acute, even slightly carinate, initial end occasionally with a very slight apical spire, and in the megalospheric form with traces of costae on the proloculum.

This variety occurs in the later Tertiary of California and is common in the recent material off the coast. Most of the living material is more slender than the fossil, especially the microspheric form, but the essential details are very similar.

Bolivina seminuda Cushman

Plate 3, figure 6

Bolivina seminuda Cushman, U. S. Nat. Mus., Bull. 71, pt. 2, 1911, p. 34, fig. 55; Contrib. Cushman Lab. Foram. Res., vol. 2, pt. 2, 1926, p. 43.

Test elongate, subcylindrical, very slightly compressed, initial end rounded; chambers numerous, high, very slightly inflated; sutures distinct but not depressed; wall hyaline, the lower half of each chamber with rather coarse foramina, the upper half clear; aperture elongate, loop-shaped; transparent except the lower half of each chamber, which is whitish.

The type specimens are from Bering Sea. In the present collection it occurs as far south as Panama. In the Pliocene of California the species occur in the Middle and Upper Fernando.

Subfamily Uvigerininae

Genus **Uvigerina** d'Orbigny, 1826

Uvigerina pigmea d'Orbigny var. **curticosta** Cushman n. var.

Plate 4, figure 1

Variety with the costae high and thin, those of each chamber separate from those of the adjacent ones, especially in the earlier development.

Holotype (U. S. Nat. Mus., No. 20297) from Lydonia station 33, Lat. 7° 01.5′ N, Long. 80° 59′ W; 800 fathoms. It also occurs at many other stations in the area. The short, high, plate-like costae independent of those of other chambers gives a peculiar appearance to this variety.

Uvigerina peregrina Cushman

Plate 3, figure 13

Uvigerina pygmaea Flint (not *U. pigmea* d'Orbigny), Rept. U. S. Nat. Mus., 1897 (1899), p. 320, pl. 68, fig. 2.

Uvigerina peregrina Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 166, pl. 42, figs. 7–10.

Test elongate, widest in the middle, ends rounded; chambers numerous, inflated, distinct; sutures deeply depressed; wall with numerous longitudinal costae, about ten on each chamber in the adult, not continuous from one chamber to another, high, thin, often broken into spinose or irregular short portions near the ends of the test, surface in general granular; aperture circular with a distinct neck and lip.

This is in general a cold-water species found at many stations in the western north Atlantic off the coast of New England northward. A very similar form occurs in this collection at numerous stations, mostly in cold water.

Uvigerina peregrina Cushman var. **bradyana** Cushman

Plate 4, figure 2

Uvigerina peregrina Cushman var. *bradyana* Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 168, pl. 42, fig. 12.

Variety differing from the typical in the more elongate, slender, less coarsely punctate test, and the fewer and lower costae.

There are a number of elongate specimens that seem very distinct and are probably close to if not identical with this variety.

Uvigerina ampullacea H. B. Brady

Uvigerina asperula Czjzek var. *ampullacea* H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 579, pl. 75, figs. 10, 11.

Uvigerina ampullacea Cushman, U. S. Nat. Mus., Bull. 104, pt. 4, 1923, p. 162, pl. 42, figs. 5, 6.

Test composed of a group of chambers making it oval in form and broadly rounded at the base, compact, followed by one or two chambers somewhat detached from the general mass; sutures slightly depressed; wall finely spinose, the apertural end of the last-formed chamber somewhat drawn out into a tapering neck, with a slightly phialine lip.

This is a widely distributed species and occurs at a considerable number of stations in this collection. A very small variety with a more tapering form, which may possibly be distinct, occurs at a few stations.

Uvigerina senticosa Cushman n. sp.

Plate 3, figure 14

Test fusiform, broadest toward the apertural end, initial end rounded; chambers numerous, inflated; sutures distinct and depressed; wall in the early portion roughened with bristly points, very fine and numerous, not as conspicuous in later chambers except in the sutural regions; apertural end with a short cylindrical neck and slightly flaring lip. Length, up to 0.85 mm.

Holotype (U. S. Nat. Mus., No. 20298) from Guide station 3, Lat. 32° 02′ N, Long. 119° 43′ W; 1390 fathoms. It also occurs at a number of other stations.

In some respects this resembles *U. canariensis* d'Orbigny, but it has a distinct bristly ornamentation.

Genus **Angulogerina** Cushman, 1927

Angulogerina carinata Cushman n. sp.

Plate 4, figure 3

Test generally triangular in section, initial end bluntly rounded; chambers few, distinct, the three sides flattened, the angles with sharp carinae often with fine radial tubules; sutures distinct, depressed; wall smooth, thick, opaque; aperture with a very short neck and distinct lip. Length, up to 0.90 mm.

Holotype (U. S. Nat. Mus., No. 20299) from Guide station 12, Lat. 32° 28′ N, Long. 118° 20′ W; 429 fathoms. It also occurred at the following stations: Guide 13, 16; Lydonia 30, 31.

This species is a distinct one on our west coast, and I have seen excellent specimens of larger size from the Gulf of California. It is evidently the same as the specimen figured by Brady in the "Challenger" Report, plate 74, figure 18, from north of Juan Fernandez, a locality that would bring it into the same faunal area.

Family ROTALIIDAE

Subfamliy SPIRILLININAE

Genus **Spirillina** Ehrenberg, 1841

Spirillina vivipara Ehrenberg (?)

There is a single specimen of *Spirillina*, from Discoverer station 42M, that has many coils, the coiled chamber rounded and unornamented. The perforations are very fine, and none of the large coarse ones so characteristic of *S. vivipara* are present.

Subfamily Discorbisinae

Genus **Discorbis** Lamarck, 1804

Discorbis isabelleana (d'Orbigny)

Plate 4, figure 4

Rosalina Isabelleana d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, Foraminifères, p. 43, pl. 61, figs. 10–12.

Discorbina isabelleana H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 646, pl. 88, figs. 1*a–c*(?).

Discorbina vilardeboana H. B. Brady (not d'Orbigny), *op. cit.*, p. 645, pl. 88, fig. 2.

Test trochoid, in edge view biconvex, spire low; periphery acute but not carinate; six chambers in the last-formed coil, distinct, increasing regularly in size as added, ventrally with a slight lip in the umbilical region which is depressed; sutures very distinct, strongly curved on the dorsal side, less curved on the ventral side; wall smooth, finely perforate, aperture a ventral slit near the umbilical end of the chamber. Diameter, 0.50 mm.

This species occurred at Scripps station 1622. It is very typical and represents the species described by d'Orbigny much more closely than the figure in the "Challenger" Report referred to this name. Brady's figure, referred to *Discorbina vilardeboana,* is much more like this species. D'Orbigny's *Rosalina vilardeboana* has a rounded periphery and is later referred to in this paper under *Valvulineria.*

Genus **Valvulineria** Cushman, 1926

Valvulineria araucana (d'Orbigny)

Plate 4, figures 7, 8

Rosalina araucana d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, Foraminifères, p. 44, pl. 6, figs. 16–18.

Test trochoid, dorsal side more convex than the ventral; periphery rounded; chambers very distinct, seven or eight in the last-formed coil, narrow and curved on the dorsal side, ventrally, triangular; sutures very distinct, very slightly depressed, very slightly limbate; wall smooth, conspicuously perforate, ventral side with a clear space toward the periphery; aperture beneath a prominent flat valvular tooth. Diameter, 0.60 mm.

D'Orbigny's original specimens were from the coast of Chile. The specimens in our collection are from Guide stations 8, 12, 13, 17, 18. They very closely agree with d'Orbigny's figure even in minute detail, while most of the figured specimens referred by authors to d'Orbigny's species differ in many essential details. It is evidently a species of the eastern Pacific, and closely related to some of the species of the Tertiary of California.

Valvulineria vilardeboana (d'Orbigny) var. **glabra** Cushman n. var.

Plate 4, figures 5, 6

Test with the same general appearance as the typical form, but smooth and polished; sutures on the dorsal side more nearly straight, spine lower, and sutures not depressed.

Holotype (U. S. Nat. Mus., No. 20300) from Lydonia station 25, Lat. 7° 56.5′ N, Long. 83° 01′ W; 810 fathoms.

The variety has many of the characters of d'Orbigny's species, but is distinct from it. It occurred also at the following stations: Guide 12, 18; Lydonia 33.

Valvulineria inaequalis (d'Orbigny)

Plate 4, figures 9, 10

Valvulina inaequalis d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, Foraminifères, p. 48, pl. 7, figs. 10–12.

Test trochoid, composed of about one and a half whorls, the last few chambers increasing rapidly in length; periphery broadly rounded, dorsal side nearly flat, ventrally strongly convex; chambers distinct, eight usually making up the last-formed coil in the adult; sutures distinct, very slightly compressed, gently curved on both dorsal and ventral sides; wall smooth and somewhat polished, finely perforate; aperture with a broad flattened valvular tooth covering the umbilical area. Length, 1.25 mm.; breadth, 0.75 mm.

The species occurs at the following stations: Guide 12, 13, 16, 17, 18, 21; Lydonia 31. It was originally described from the coast of Peru by d'Orbigny. His description gives the test as thin and fragile, but although this is apparent in the early stages, the adult has a stout, thick test. I have seen this species only from the eastern Pacific.

Valvulineria inflata (d'Orbigny)

Plate 5, figure 3

Valvulina inflata d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, Foraminifères, p. 48, pl. 7, figs. 7–9.

Test trochoid, the dorsal side flattened, ventral side convex; periphery broadly rounded; about seven chambers in the last-formed coil; distinct, ventrally inflated; sutures distinct, depressed on the ventral side, curved; wall smooth, distinctly perforate; aperture with a valvular tooth. Diameter, 0.60 mm.

The only specimen in the collection is from Discoverer station 27N. It agrees very closely with d'Orbigny's figure and description. His specimens were from the coasts of Chile and Peru.

Genus **Gyroidina** d'Orbigny, 1826

Gyroidina soldanii d'Orbigny

Rotalia (*Gyroidina*) *soldanii* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 278; Modèles, No. 36.

Rotalia soldanii Hantken, Mitt. Jahrb-ung. geol. Anstalt., 1875, p. 80, pl. 9, figs. 7 *a–c*.

Test trochoid, plano-convex, dorsal side flattened, ventral side strongly convex; chambers numerous, distinct, ten to twelve in the last-formed coil; sutures distinct and depressed; wall smooth, thick, finely perforate; umbilicus deeply excavated; aperture an elongate slit at the inner margin of the ventral side. Diameter, up to 0.85 mm.

The species occurs at the following stations: Guide 2, 3, 5, 12, 14, 15, 16, 21, 22; Lydonia 9, 10, 12, 27, 34; Discoverer 42M.

The form occurring in the eastern Pacific is identical in the smallest details with the species described by d'Orbigny and illustrated in his Modèle, No. 36. With his original model before me, I have compared the two and they agree in number of chambers, angle of the sutures, and in all the finer details.

There is another form of the species, with more rounded peripheral angle and less distinct chambers, that is represented by so few specimens that it is impossible to place it.

Subfamily Rotaliinae

Genus **Eponides** Montfort, 1808

Eponides patagonica (d'Orbigny)

Plate 5, figures 1, 2

Rotalina patagonica d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, p. 36, pl. 2, figs. 6–8.

Test trochoid, biconvex; periphery angled but not carinate; chambers seven or eight in the last-formed coil, fairly distinct; sutures slightly depressed on the ventral side, flush with the surface on the dorsal side, strongly curved dorsally, slightly so on the ventral side; wall smooth, shining, brilliant white; aperture a narrow slit about halfway between the periphery and center of the ventral side. Diameter averaging about 0.40 mm.

There are specimens referred to this species from the following stations: Guide 1, 2, 3, 8, 10, 13, 15, 16, 21; Lydonia 9, 12, 17; Discoverer 28M.

In the "Challenger" Report, Brady takes up this species of d'Orbigny and assigns to it the widely distributed pelagic species of *Globorotalia* which he figures. He notes that "notwithstanding some discrepancies" he is using d'Orbigny's name. The species of *Globorotalia* he had already named *Pulvinulina scitula* and the widely

distributed form can therefore be known as *Globorotalia scitula* (H. B. Brady). The *Eponides patagonica* (d'Orbigny) is very small in size, usually with no sign of the spinose condition in Brady's species and not at all umbilicate.

Eponides tenera (H. B. Brady)

Plate 5, figures 6, 7

Truncatulina tenera H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 665, pl. 95, figs. 11*a–c*; Cushman, U. S. Nat. Mus., Bull. 71, pt. 5, 1915, p. 37, pl. 16, fig. 2; pl. 23, fig. 6.

Test trochoid, biconvex; periphery acute, slightly lobulated; the earlier portion with the spire convex, the last-formed coil in the adult flattened and broader, with five to seven chambers; sutures very distinct, straight, and radial, only slightly depressed; wall smooth and polished; aperture narrow, between the periphery and the center of the ventral side. Diameter, up to 0.80 mm.

The species is characteristic of this area, occurring at the following stations: Guide 1, 2, 3, 5, 12, 13 (24), 36 (24); Lydonia 8, 9, 10, 12, 17, 18, 19, 21, 22, 25, 27; Discoverer 9D.

Three of Brady's four original stations were off the coast of South America. Our specimens are very typical.

Subfamily Siphonininae

Genus **Epistomina** Terquem, 1883

Epistomina partschiana (d'Orbigny)

Plate 5, figures 4, 5

Rotalina partschiana d'Orbigny, Foram. Foss. Bass. Tert. Vienne, 1846, p. 153, pl. 7, figs. 28–30; pl. 8, figs. 1–3.

Pulvinulina partschiana Reuss, Sitz. Akad. Wiss. Wien, vol. 62, 1870, p. 36; Cushman, U. S. Nat. Mus., Bull. 71, pt. 5, 1915, p. 64, fig. 60.

Test trochoid, biconvex; periphery acute or slightly rounded; chambers numerous, eight to ten in the last-formed coil, not inflated; sutures fairly distinct, often limbate but not raised, oblique on the dorsal side, umbilical region closed; wall thick, often flaking off in layers in worn specimens; aperture ventral, midway between the periphery and center, with a supplementary aperture on each chamber, elongate and narrow, parallel with and just ventral to the periphery, becoming closed in the earlier chambers. Diameter, up to 1 mm.

This is one of the common species of the collection, occurring at the following stations: Guide 3, 5, 10, 13, 14, 15, 21, 22; Lydonia 3, 8, 10, 18, 19, 21, 25, 33, 35.

Subfamily Baggininae

Genus **Cancris** Montfort, 1808

Cancris auricula (Fichtel and Moll)

Plate 5, figure 10

Test trochoid, biconvex, elongate, slightly carinate, composed of few chambers, six or seven making up the last-formed coil; chambers distinct, increasing in size and length as added, the last-formed one in the adult making up more than half the surface of the ventral side; sutures slightly depressed, gently curved; wall finely and distinctly perforate except for a semicircular area at the base of the chamber on the ventral side which is clear and transparent; aperture a narrow ventral slit. Length, 0.80 mm.

This seems to have a comparatively shallow-water habitat from the records. Its only occurrences are at Scripps stations 1531 and 1622.

Family CASSIDULINIDAE

Subfamily Ceratobulimininae

Genus **Pulvinulinella** Cushman, 1926

Pulvinulinella culter (Parker and Jones)

Plate 5, figures 8, 9

Planorbulina culter (Parker and Jones), Philos. Trans., vol. 155, 1865, p. 421, pl. 19, figs. 1*a*, *b*.

Truncatulina culter H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 668, pl. 96, figs. 3*a–c*; Cushman, U. S. Nat. Mus., Bull. 71, pt. 5, 1915, p. 41, pl. 16, fig. 1; fig. 44.

Anomalina bengalensis Schwager, Novara Exped., Geol. Theil, vol. 2, 1866, p. 259, pl. 7, fig. 111.

Test trochoid, plano-convex, dorsally flattened, ventrally convex, carinate, the carina usually somewhat serrate; ten or more chambers in the last-formed coil; sutures on the dorsal side limbate and raised, confluent, leaving triangular areas to represent the chamber surface; ventrally the sutures are narrow and depressed; aperture a narrow opening nearly parallel to the periphery. Diameter, 0.60 mm.

Specimens that are typical occurred at Guide station 3, but nowhere else in the collection. The aperture in this species shows it to belong to *Pulvinulinella*.

Pulvinulinella pacifica Cushman n. sp.

Plate 5, figures 14, 15

Test trochoid, plano-convex, dorsal side flattened, ventral side strongly convex; periphery acute or slightly keeled, often lobulated; chambers distinct, not inflated, seven in the last-formed coil; sutures obliquely curved on the dorsal side, only slightly curved on the ventral, slightly limbate, not raised nor depressed; wall finely perforate, shining; aperture elongate, narrow, nearly parallel to the periphery, ventral. Diameter, usually not exceeding 0.50 mm.

Holotype (U. S. Nat. Mus., No. 20301) from Discoverer station 19J, Lat. 36° 50′ N, Long. 122° 15′ W; 735 fathoms. This is one of the most abundant species in the collection and shows very little variation of any sort. It occurs at the following stations: Guide 2, 4 (24), 8, 10, 13, 15 (24), 16, 17, 17 (24), 18, 20, 21 22 (24), 24 (24); Lydonia 25, 26, 33, 34, 35; Discoverer 19J, 20K, 14L, 42M, 27N, 4Q.

Pulvinulinella bradyana Cushman n. sp.

Plate 5, figures 11–13

Truncatulina pygmaea H. B. Brady (in part) (not Hantken), Rept. Voy. Challenger, Zoology, vol. 9, 1884, pl. 95, fig. 10(?).

Test trochoid, biconvex; periphery acute, slightly lobulated in an angular manner; chambers distinct, usually eight in the last-formed coil, not inflated, the posterior peripheral angle somewhat projecting; sutures very distinct, slightly limbate, oblique on the dorsal side, nearly radial on the ventral, umbilical regions closed; wall smooth, finely perforate; apertural face obliquely truncate; aperture elongate, narrow, nearly parallel to the periphery, with a slight tooth-like projection on the ventral side. Diameter, 0.40 mm.

Holotype (U. S. Nat. Mus., No. 20302) from Lydonia station 30, Lat. 7° 01′ N, Long. 81° 48.7′ W; 428 fathoms. The species is common at this one station. It is difficult to see how Brady could place this form under Hantken's species as a comparison of the original figures of the two shows very decided differences. Although the aperture on the ventral side is shown in Brady's figure, it is so characteristic that probably his belongs under our species. Figure 9 does not show the typical aperture.

This species is particularly interesting, showing the relationship of *Pulvinulinella* to *Cassidulina*. In the last few chambers of *P. bradyana* there are often seen traces of supplementary chambers coming in near the periphery, and the toothed aperture is very similar to that seen in many species of *Cassidulina*. This eastern Pacific region seems to be a region of great development of these two genera and they are also very abundant in the later Tertiary of California.

Subfamily CASSIDULININAE

Genus **Cassidulina** d'Orbigny, 1826

Cassidulina pulchella d'Orbigny

Plate 6, figure 1

Cassidulina pulchella d'Orbigny, Voy. Amér. Mérid., 1839, Foraminifères, p. 57, pl. 8, figs. 1–3; Cushman and Hughes, Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 1, 1925, p. 13, pl. 2, figs. 6*a*, *b*.

Test compressed, nearly circular in side view; periphery somewhat angled with the angles of the chamber slightly projecting; chambers distinct, six or seven pairs in the last-formed coil; sutures distinct, depressed, not limbate; wall smooth; aperture elongate, nearly parallel to the axis of coiling, with a slight tooth.

The types of this species came from the coast of Peru. It is common at the southern station of the area, and rare at a few other stations as follows: Guide 10, 13, 21; Lydonia 30. It also occurs in the Pliocene of California.

Cassidulina corbyi Cushman and Hughes

Plate 6, figure 3

Cassidulina corbyi Cushman and Hughes, Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 1, 1925, p. 14, pl. 2, figs. 3*a*, *b*.

Test oval, somewhat longer than broad; periphery acute, strongly serrate, central portion slightly umbilicate; chambers distinct, six or seven pairs in the last-formed coil, strongly angled and produced at the periphery; sutures fairly straight, depressed, not limbate; wall smooth; aperture narrow, in the axis of coiling.

This species was originally described from the Pliocene of California. It occurs at Lydonia station 30, off Panama.

Cassidulina limbata Cushman and Hughes

Plate 6, figure 4

Cassidulina laevigata Bagg, U. S. Geol. Surv., Bull. 513, 1912, p. 43 (not d'Orbigny).

Cassidulina limbata Cushman and Hughes, Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 1, 1925, p. 12, pl. 2, figs. 2*a–c*.

Test nearly circular in side view, the last-formed chamber slightly projecting; periphery slightly lobulate, carinate; chambers very distinct, six pairs in the last-formed coil, the central portion of each chamber narrowest; sutures very distinct, broadly limbate, central portion with a distinct umbo of clear shell material; aperture narrow, elongate, parallel to the axis of coiling, with a slight tooth.

This species is very abundant and well developed in the Pliocene of California, and it is not surprising to find it in this recent material. It occurs at the following stations: Guide 13, 16; Discoverer 13N; Scripps 1531, 1534, 1622.

Cassidulina tortuosa Cushman and Hughes

Plate 6, figure 2

Cassidulina tortuosa Cushman and Hughes, Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 1, 1925, p. 14, pl. 2, figs. 4*a–c*.

Test broadly ovate in side view, thickest in the center, often equaling half the length; periphery subacute; chambers distinct, six or seven pairs in the last-formed coil, each chamber much curved forming a distinct angle at the central portion; sutures distinct, slightly limbate, not depressed, with prominent angles, central region with an umbo of clear shell material; aperture elongate, outer end rounded with a tooth at the side, parallel to the axis of coiling.

Very typical specimens occur at Scripps stations 1531, 1536, and 1622. It did not occur in the deeper offshore material. The originals were from the later Tertiary of California.

Cassidulina crassa d'Orbigny

Cassidulina crassa d'Orbigny, Voy. Amér. Mérid., vol. 5, pt. 5, 1839, Foraminifères, p. 56, pl. 7, figs. 18–20.

Test compressed, sides nearly parallel in edge view; periphery rounded, chambers distinct, five or six pairs making up the last-formed coil, somewhat inflated; sutures distinct, slightly depressed, not limbate; wall smooth, polished; aperture rather short and broad, at an angle with the axis of coiling.

This species was described by d'Orbigny from the coast of South America. There are specimens in the present collection that are more compressed than *C. californica* which may be referred to d'Orbigny's species but they are apparently not typical. The young of the species are more nearly globular.

Cassidulina subglobosa H. B. Brady var. **ornata** Cushman n. var.

Plate 6, figure 6

Test small, differing from the typical in the ornamentation of the chambers, the earlier portion of the test being covered with a series of raised irregular reticulations, wanting in the last-formed chamber.

Holotype of variety (U. S. Nat. Mus., No. 20303) from Guide station 3, Lat. 32° 02′ N, Long. 119° 43′ W; 1390 fathoms.

There are many small specimens from various stations that might at first glance be referred to *C. subglobosa* H. B. Brady but they do not have the apertural characters of that species and no adult *C. subglobosa* were found in the collection. It is likely that they are the young of some of the other species, probably *C. crassa*.

Cassidulina delicata Cushman n. sp.

Plate 6, figure 5

Test much compressed, broadly ovate; periphery subacute; chambers very distinct, broad, four pairs making up the last-formed coil, the chambers of the opposite series barely showing as a very small triangle near the periphery, inflated; sutures very distinct, depressed, not limbate; wall very thin, very finely perforate, smooth and polished; aperture a very elongate narrow slit, following the curve of the previous chamber from umbilical end to periphery, of uniform width. Diameter, 0.40 mm.

Holotype (U. S. Nat. Mus., No. 20304) from Lydonia station 30, off Panama. The species also occurs at Guide stations 4(24), 10, 13, 15, 21.

This is one of the most peculiar species of the genus in its withdrawing of the chambers to each side and in the peculiar aperture. In this connection it may be noted that the species I have described from farther north on the Pacific coast as *Cassidulina charlottensis* (Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 2, 1925, p. 41, pl. 6, figs. 6, 7) really belongs to the genus *Robertina* d'Orbigny, and should be known as *Robertina charlottensis* (Cushman). The only other species of the genus, *Robertina arctica* d'Orbigny, is, as its name implies, also a cold-water species.

Genus **Cassidulinoides** Cushman, 1927

Cassidulinoides bradyi (Norman) (?)

There are specimens of an uncoiled form with an elongate aperture that may belong here. They are from the following stations: Guide 1; Lydonia 12; Discoverer 27N, 4Q.

Subfamily Ehrenbergininae

Genus **Ehrenbergina** Reuss, 1850

Ehrenbergina compressa Cushman n. sp.

Plate 6, figure 7

Test compressed, composed of few chambers, about four pairs making up the uncoiled portion, distinct, only slightly inflated; periphery of each ending in a blunt angle, at the median line not raised and unornamented; wall smooth; aperture very elongate, Length, 0.50 mm.

Holotype (U. S. Nat. Mus., No. 20305) from Lydonia station 30, off Panama. It also occurred at Lydonia station 25. This is very different from the other Pacific species, and more nearly resembles the type species of the genus, *E. serrata* Reuss. The Pacific species is much narrower, and a more rapidly tapering form, however.

Ehrenbergina bradyi Cushman

Plate 6, figure 8

Ehrenbergina serrata H. B. Brady (part) (not Reuss), Rept. Voy. Challenger, Zoology, vol. 9, 1884, pl. 55, figs. 2, 3, 5(?), (not 4, 6, 7).

Ehrenbergina bradyi Cushman, U. S. Nat. Mus., Bull. 104, pt. 3, 1922, p. 134, pl. 26, fig. 5; Proc. U. S. Nat. Mus., vol. 70, 1927, pt. 5, pl. 2, figs. 1*a–c*.

Test triangular in front view and in transverse section, five or six pairs of chambers making up the uncoiled portion; periphery with spines directed backward, middle portion of the ventral side with the chambers fusing along the median line in the young, later opening slightly with a median furrow, chambers somewhat fused in the middle; sutures very slightly marked; wall opaque, thick; aperture narrow, curved, short, one side with a thickened curved lip, the other thin and flat. Length, 1 mm.

It occurs at Guide stations 1, 2, 3, 21.

This is a peculiar appearing species with heavy thick wall, spines pointing backward, median line fused below and opened above into a narrow furrow and short, curved aperture.

Family CHILOSTOMELLIDAE

Subfamily CHILOSTOMELLINAE

Genus **Chilostomella** Reuss, 1850

Chilostomella oolina Schwager

Chilostomella oolina Schwager, Boll. Com. Geol. Ital., vol. 9, 1878, p. 527, pl. 1, fig. 16; Cushman, Contrib. Cushman Lab. Foram. Res., vol. 1, pt. 4, 1926, p. 74, pl. 11, figs. 3–10.

Test elongate, three times as long as wide, both ends broadly rounded sides nearly parallel for most of their length; wall thin, distinctly punctate; aperture very narrow, curved. Length, usually less than 1 mm.

This has proved to be one of the most widely distributed species in this collection, never occurring in great numbers at any one station. The records include the following stations: Guide 4(24), 5, 8, 10, 12, 13, 15, 15(24), 16, 17, 18, 21, 22, 22(24), 26(24); Lydonia 3, 9, 12, 18, 25, 27, 30, 33, 34, 35; Discoverer 9E, 12E, 20E, 22E, 11F, 17F, 11G, 15G, 19J, 42M, 20M, 27N, 4Q.

Subfamily ALLOMORPHINELLINAE

Genus **Chilostomellina** Cushman, 1926

Chilostomellina fimbriata Cushman

Plate 6, figure 9

Chilostomellina fimbriata Cushman, Contrib. Cushman, Lab. Foram. Res., vol. 1, pt. 4, 1926, p. 78, pl. 11, figs. 22*a–c*.

Test composed of a few inflated chambers, the last ones planospiral, the last-formed one almost completely enveloping the preceding ones; wall thin, finely perforate; aperture small, crescentiform, the sides of the chamber next the aperture markedly fimbriate.

One of the "finds" in this collection is this species recently described from Bering Sea. It is typical and occurs at the following stations: Guide 13(24), 22(24); Discoverer 27N, 4Q. These are cold-water stations, and show that the species ranges southward along the coast in the colder water.

Genus **Pullenia** Parker and Jones, 1862

Pullenia bulloides d'Orbigny

Nonionina bulloides d'Orbigny, Ann. Sci. Nat. vol. 7, 1826, p. 293, No. 2; Foram. Foss. Bass. Tert. Vienne, 1846, p. 107, pl. 5, figs. 9, 10.

Pullenia bulloides Parker and Jones, *in* Carpenter, Introd. Foram., 1862, p. 184, pl. 12, fig. 12.

Test subglobular, last stages at least planospiral; chambers few, four in the last-formed coil, completely involute, semicircular in front view; sutures distinct but not depressed; wall smooth, finely perforate; aperture elongate, parallel to the surface of the preceding chamber.

This small species has often been referred to *Pullenia sphaeroides* (d'Orbigny), which from the Modèle is a different species from *bulloides* with a different contour and fewer chambers. *Pullenia bulloides* occurs at the following stations: Guide 2, 3; Lydonia 8, 12, 18, 25, 34; Discoverer 9D, 11G. It may be noted here that this species may be the young of *Sphaeroidina bulloides* and the two are often found together.

Pullenia quinqueloba (Reuss)

Nonionina quinqueloba Reuss, Zeitschr. deutsch. geol. Ges., vol. 3, 1851, p. 47, pl. 5, figs. 31*a, b*.

Pullenia quinqueloba H. B. Brady, Proc. Roy. Soc. Edinburgh, vol. 11, 1882, p. 712; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 42, pl. 8, figs. 5–9, 11.

Test close-coiled, planospiral, bilaterally symmetrical, biconvex, rounded; wall smooth, polished, finely perforate; sutures slightly depressed, distinct; aperture elongate, narrow, at the base of the chamber.

A few specimens may be referred to this species: Guide 6(24), 8, 12, 20.

Pullenia apertura Cushman n. sp.

Plate 6, figure 10

Test composed of few chambers, close-coiled, equally biconvex, about six chambers in the last-formed whorl, rapidly increasing in size as added; periphery rounded; sutures curved, indistinct; wall smooth and polished, finely perforate; apertural face generally triangular, the aperture large, an even opening extending from one umbilicus to the other with a trace of a lip above. Length, 0.45 mm.

Holotype (U. S. Nat. Mus., No. 20307) from Guide station 10, Lat. 33° 13′ N, Long. 119° 57′ W; 412 fathoms. This is a peculiar species in its general shape and the very large aperture.

Subfamily Sphaeroidininae

Genus **Sphaeroidina** d'Orbigny, 1826

Sphaeroidina bulloides d'Orbigny

Sphaeroidina bulloides d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 267; Modèles No. 65; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 36, pl. 7, figs. 1–6.

Test subspherical, the exterior usually formed by the last three chambers, entirely covering the earlier chambers, early chambers as in *Pullenia;* sutures very slightly depressed; wall smooth and polished, minutely perforate; aperture comparatively small, consisting of an arched, semicircular opening, sometimes with a flattened tooth.

This species is rare, occurring at the following stations: Guide 2; Lydonia 3, 9, 25, 27.

The specimens most closely resemble the small form figured by Brady from off Tahiti, "Challenger" Report, pl. 84, figs. 3, 4.

Family GLOBIGERINIDAE

Subfamily Globigerininae

Genus **Globigerina** d'Orbigny, 1826

Globigerina bulloides d'Orbigny

There are a very few specimens that can possibly be referred to this species. It is evidently not one of the characteristic species of the eastern Pacific, and the few small specimens referred to *G. bulloides* may be the young of *G. sacculifera* H. B. Brady.

Globigerina digitata H. B. Brady

Globigerina digitata H. B. Brady, Quart. Jour. Micr. Sci., vol. 90, 1879, p. 72; Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 599, pl. 80, figs. 6–10; pl. 82, figs. 6–7; Cushman, U. S. Nat. Mus., Bull: 104, pt. 5, 1924, p. 11, pl. 2, figs. 9–11.

Test regularly spiral, trochoid, consisting of two or three volutions; early chambers inflated, subspherical, later chambers much elongated, the tip usually rounded; wall reticulate; aperture opening into the central umbilical opening, or in the elongate, adult chambers, making up the larger part of the base of the chamber, the area of attachment being very much reduced.

Specimens occur at Lydonia stations 3, 12, and 35. As usual the species is rare. Even the young stages, before the elongate adult chambers are developed, can be recognized.

Globigerina conglomerata Schwager

Globigerina conglomerata Schwager, Novara Exped., Geol. Theil., pt. 2, 1866, p. 255, pl. 7, fig. 113.

Globigerina dutertrei H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, pl. 81, figs. 1*a–c* (not d'Orbigny).

Globigerina dubia H. B. Brady, *op. cit.*, pl. 79, figs. 17*a–c* (not Egger).

Test subglobose, in the early stages consisting of but four chambers in each coil, closely grouped; aperture small and with a distinct lip; in later stages with five or six chambers in the coil, the last coil usually below the level of the others and with a distinct umbilicus.

This is the dominant species of the genus in the eastern Pacific, occurring at the following stations and in large numbers: Guide 1, 3, 4, 8, 10, 12, 13, 13(24), 14, 15, 16, 16(24), 17, 17(24), 18, 20, 21, 22, 32(24); Lydonia 3, 4, 7, 8, 9, 10, 12, 17, 18, 25, 26, 27, 31, 33, 34, 35; Discoverer 9D, 10F, 4Q; Scripps 1531, 1536, 1618, 1619, 1622.

Schwager's species fits very closely the early stages of this species, as does also Brady's figure of *G. dutertrei,* while the "Challenger" figure of *G. dubia* is the adult form. This latter is very different from *G. dubia* Egger from the Tertiary of Germany.

There is much to be done in the study of living and fossil species of the Globigerinidae, and there are many forms that have been referred to a few species which closer study will prove to be distinct and of definite range and distribution.

Genus **Globigerinoides** Cushman, 1927

Globigerinoides rubra (d'Orbigny)

Globigerina rubra d'Orbigny, *in* De la Sagra, Hist. Fis. Pol. Nat., Cuba, 1839, Foraminifères, p. 94, pl. 4, figs. 12–14; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 15, pl. 3, figs. 4–7.

Test composed of several inflated chambers arranged in an elongate trochoid spire of about three volutions, each with three chambers; walls reticulate, with spines in pelagic specimens; aperture an arched opening at the umbilical border of the chamber, in the later chambers supplemented by openings on the upper inner border of the chamber.

The Pacific form lacks the red color of the typical West Indian form and has a somewhat broader, lower spire. It may prove to be distinct. Specimens occur at the following stations: Guide 13; Lydonia 17, 26, 27; Scripps 1530, 1531, 1622. These are mostly in the southern portion of the area.

Globigerinoides sacculifera (H. B. Brady)

Globigerina helicina Carpenter (not d'Orbigny), Introd. Foram., 1862, pl. 12, fig. 11.

Globigerina sacculifera H. B. Brady, Geol. Mag., vol. 4, 1877, p. 535; Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 604, pl. 80, figs. 11–17; pl. 82, figs. 4; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 21, pl. 4, figs. 1–6.

Test composed of numerous chambers in a very low spire, in the young a single umbilical opening, in the adult numerous secondary openings developing at the inner margin on the dorsal side and the chambers elongating, often crenulate and compressed at the border, early chambers very distinctly reticulate, later ones smoother.

This species is found only in the southern portion of the area as follows: Lydonia 8, 9, 17, 18, 19, 25, 26, 35. It is a species of warm ocean currents.

Globigerinoides conglobata (H. B. Brady)

Globigerina conglobata H. B. Brady, Quart. Jour. Micr. Sci., vol. 19, 1879, p. 72; Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 603, pl. 80, figs. 1–5; pl. 82, fig. 5; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 18, pl. 3, figs. 8–13.

There is but a single member of this species in the collection, from Lydonia station 18.

Genus **Globigerinella** Cushman, 1927

Globigerinella aequilateralis (H. B. Brady)

Globigerina aequilateralis H. B. Brady, Quart. Jour. Micr. Sci., vol. 19, 1879, p. 71; Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 605, pl. 80, figs. 18–21; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 25, pl. 4, figs. 7, 8.

Test composed of numerous inflated chambers, trochoid in the young, later in a bilaterally symmetrical, planospiral coil; chambers increasing rapidly in size as added, usually five to six visible in side view; sutures much depressed; wall reticulate; aperture a large, arched opening at the base of the chamber.

The species occurs at the following stations: Guide 5, 14; Lydonia 12, 17, 25, 35; Scripps 1619.

The eastern Pacific specimens are much less open than are those of the tropical Atlantic.

Subfamily Orbulininae

Genus **Orbulina** d'Orbigny, 1826

Orbulina universa d'Orbigny

Orbulina universa d'Orbigny, *in* De la Sagra, Hist. Fis. Pol. Nat., Cuba, 1839, Foraminifères, p. 3, pl. 1, fig. 1; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 28, pl. 5, figs. 2–9.

Specimens of this common species were obtained at the following stations: Guide 2, 3, 5, 8, 10, 12, 13, 14, 15, 18, 20, 21, 22; Lydonia 3, 4, 8, 9, 12, 18, 25, 26; Discoverer 9D, 15G; Scripps 1530, 1531, 1534, 1618, 1619, 1622.

Subfamily Pulleniatininae

Genus Pulleniatina Cushman, 1927

Pulleniatina obliquiloculata (Parker and Jones)

Pullenia obliquiloculata Parker and Jones, Philos. Trans., vol. 155, 1865, p. 368, pl. 19, figs. 4*a*, *b*; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 43, pl. 8, fig. 10.

Test in the young, globigerine, in the adult, obliquely nautiloid, subglobular, later chambers completely covering the earlier ones; sutures very slightly depressed; wall in the young, reticulate or spinose, becoming nearly smooth in the adult; aperture large, curved at the base of the chamber, often with a rounded lip.

This is a pelagic species and is very different in its development and relationships from the other species which have been placed in *Pullenia*. This species clearly belongs with the Globigerinidae. It occurs at the following stations: Guide 5; Lydonia 3, 17, 18, 19, 25, mostly in the southern portion of the area.

Genus **Sphaeroidinella** Cushman, 1927

Sphaeroidinella dehiscens (Parker and Jones)

Sphaeroidina dehiscens Parker and Jones, Philos. Trans., vol. 155, 1865, p. 369, pl. 19, figs. 5*a–c*; Cushman, U. S. Nat. Mus., Bull. 104, pt. 5, 1924, p. 38, pl. 7, figs. 7, 8; pl. 8, figs. 1, 2.

This species is very rare at Lydonia station 25, and was not obtained elsewhere. The young stages are like *Globigerina* and the species belongs in this family and not in the genus *Sphaeroidina,* in which the young stages are very different.

Family GLOBOROTALIIDAE

Genus **Globorotalia** Cushman, 1927

Globorotalia tumida H. B. Brady

Pulvinulina menardii d'Orbigny, var. *tumida* H. B. Brady, Geol. Mag., vol. 4, 1877, p. 294.

Pulvinulina tumida H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 692, pl. 103, figs. 4–6; Cushman, U. S. Nat. Mus., Bull. 71, pt. 5, 1915, p. 56, pl. 22, fig. 3.

This is a rare species in the material, occurring only at Lydonia stations 12 and 17. It is typically a species of warm currents.

Globorotalia menardii (d'Orbigny)

Rotalia menardii d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 273; Modèles No. 10.

Pulvinulina menardii Owen, Jour. Linn. Soc. London (Zool.), vol. 9, 1867, p. 148, pl. 5, fig. 6; Cushman, U. S. Nat Mus., Bull. 71, pt. 5, 1915, p. 54, pl. 22, fig. 2.

Although there are more records for this species than the preceding, they are all from the warmer parts of the area as follows: Lydonia 9, 10, 12, 17, 18, 19, 20, 25, 27, 31; Scripps 1622.

Globorotalia scitula H. B. Brady

Pulvinulina scitula H. B. Brady, Proc. Roy. Soc. Edinburgh., vol. 11, 1882, p. 716.

Pulvinulina patagonica H. B. Brady (not *Rotalia patagonica* d'Orbigny), Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 693, pl. 103, figs. 7*a–c*; Cushman, U. S. Nat. Mus., Bull 71, pt. 5, 1915, p 57 (not fig. 56 in text).

This species, previously referred to under *Eponides patagonica,* is already named by Brady, and his name may be used. It is not the same as d'Orbigny's species. It occurs at the following stations: Guide 1; Lydonia 3, 9, 26, 35; Scripps 1536.

Globorotalia truncatulinoides (d'Orbigny)

Rotalina truncatulinoides d'Orbigny, *in* Barker, Welb and Berthelot, Hist. Nat. Isles Canaries, vol. 2, pt. 2, Foraminifères, 1839, p. 132, pl. 2, figs. 25–27.

Pulvinulina truncatulinoides Parker and Jones, Philos. Trans., vol. 155, 1865, p. 398, pl. 16, figs. 41–43; Cushman, U. S. Nat. Mus., Bull. 71, pt. 5, 1915, p. 59, pl. 23, fig. 4; fig. 57.

Specimens of this widely distributed species are rare at Guide stations 1, 4(24), and 18.

Family ANOMALINIDAE

Subfamily ANOMALININAE

Genus **Planulina** d'Orbigny, 1826

Planulina ornata (d'Orbigny)

Plate 6, figure 12

Truncatulina ornata d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, Foraminifères, p. 40, pl. 6, figs. 7–9.

Test in the young, trochoid, biconvex, in the later stages with the chambers widely spreading and evolute; chambers very distinct, elongate, curved; periphery subacute, with a thickened keel; sutures distinct, limbate, raised in the earlier portion and confluent with the peripheral carina, in the last few chambers depressed; surface beautifully ornamented with coarse perforations, their borders raised forming a reticulation, this ornamentation covering all the surface except the smooth raised sutures; aperture peripheral in the adult and extending onto the dorsal side, with a flat lip. Diameter, up to 1.25 mm.

The type specimens were described by d'Orbigny from off the coast of Chile, and it is a common species in the eastern Pacific, usually referred to *Truncatulina wuellerstorfi* Schwager. It occurs at the following stations: Guide 1, 2, 3, 4(24), 5, 10, 12, 13, 16, 17, 18, 21; Lydonia 12, 20, 25, 27, 33, 34, 35; Discoverer 27N; Scripps 1534, 1622.

It seems strange that d'Orbigny's species should have so long been overlooked, as his description and figure are both good.

In the microspheric form, the early portion is high and the test biconvex, but in the later portion, the flattened form is taken on and the test becomes evolute and nearly bilaterally symmetrical. The species is common also in the late Tertiary of California.

Genus **Pellatispira** Boussac, 1906

Pellatispira pauperata (Parker and Jones)

Plate 6, figure 13

Pulvinulina repanda var. *menardii* subvar. *pauperata* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 395, pl. 16, figs. 50, 51.

Pulvinulina pauperata H. B. Brady, Rept. Voy. Challenger, Zoology, vol. 9, 1884, p. 696, pl. 104, figs. 3–11; Cushman, U. S. Nat. Mus., Bull. 71, pt. 5, 1915, p. 61, pl. 23; figs. 2, 3; fig. 58.

Test in the young, trochoid, in the adult becoming planospiral or nearly so, early chambers close-coiled, later ones becoming loosely coiled with a broad plate between the coils; periphery with a broad, thin, transparent carina; chambers numerous, inflated, ten to fifteen in the last-formed coil; sutures depressed; aperture a narrow opening on the ventral side near the periphery.

This species is present at several stations, but does not reach the size that it does in the Gulf of Mexico. It occurs at the following stations: Guide 3; Lydonia 8, 10, 25, 26. It occurs also in the late Tertiary of California. The species is referred to Boussac's genus *Pellatispira*, which has the same essential characters of a trochoid young and later a planospiral, uncoiled form with a plate between. The recent species is smooth and simpler than the fossil species, evidently living on while the more complex species have become extinct.

Subfamily Cibicidinae

Genus **Cibicides** Montfort, 1808

Cibicides vermiculata (d'Orbigny)

Plate 6, figure 11

Truncatulina vermiculata d'Orbigny, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, Foraminifères, p. 39, pl. 6, figs. 1–3.

There is a specimen from Guide station 16 that seems identical with this species as figured by d'Orbigny.

Cibicides ungeriana (d'Orbigny)

Rotalina ungeriana d'Orbigny, Foram. Foss. Bass. Tert. Vienne, 1846, p. 157, pl. 8, figs. 16–18.

Truncatulina ungeriana Reuss, Denkschr. Akad. Wiss. Wien, vol. 25, 1865, p. 161; Cushman, U. S. Nat. Mus., Bull. 71, pt. 5, 1915, p. 36, pl. 17, fig. 2; fig. 39.

Test trochoid, biconvex; periphery acute, subcarinate; chambers numerous, ten to twelve in the last-formed coil, short and broad; sutures distinct, very slightly depressed; wall coarsely perforate, especially on the dorsal side; aperture peripheral, extending up onto the dorsal side.

This is one of the common species of the region, occurring at the following stations: Guide 2, 5, 16, 17; Lydonia 3, 9, 10, 25, 26, 27, 31, 33, 34, 35; Discoverer 9D, 17G.

There are numerous other species represented by single specimens or by incomplete ones which were not thought sufficiently well determined to be included here.

EXPLANATION OF PLATES

All figures are from photographs. × 50.

PLATE 1

Fig. 1. *Bathysiphon fusca* n. sp.
Fig. 2. *Bathysiphon arenacea* n. sp.
Fig. 3. *Reophax excentricus* Cushman.
Fig. 4. *Kalamopsis(?) californica* n. sp.
Fig. 5. *Haplophragmoides tenuis* n. sp.
Fig. 6. *Haplophragmoides planissima* n. sp.

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PLATE 2

Fig. 1. *Clavulina communis* d'Orbigny var. *pallida* n. var.
Fig. 2. *Biloculina depressa* d'Orbigny.
Fig. 3. *Biloculina serrata* L. W. Bailey.
Fig. 4. *Nonion umbilicatula* (Montagu).
Fig. 5. *Nonion umbilicatula* (Montague) var. *pacifica.*
Fig. 6. *Nonion* cf. *punctata* (d'Orbigny).
Fig. 7. *Nonion labradorica* (Dawson). Apertural view.
Fig. 8. *Nonion labradorica* (Dawson). Side view.
Fig. 9. *Buliminella subfusiformis* Cushman var. *tenuata* n. var.
Fig. 10. *Bulimina ovula* d'Orbigny.
Fig. 11. *Bulimina barbata* n. sp.
Fig. 12. *Bulimina rostrata* H. B. Brady.
Fig. 13. *Bulimina pulchella* d'Orbigny.
Fig. 14. *Bulimina inflata* Seguenza.
Fig. 15. *Bulimina spinifera* n. sp.
Fig. 16. *Bulimina pagoda* n. sp.

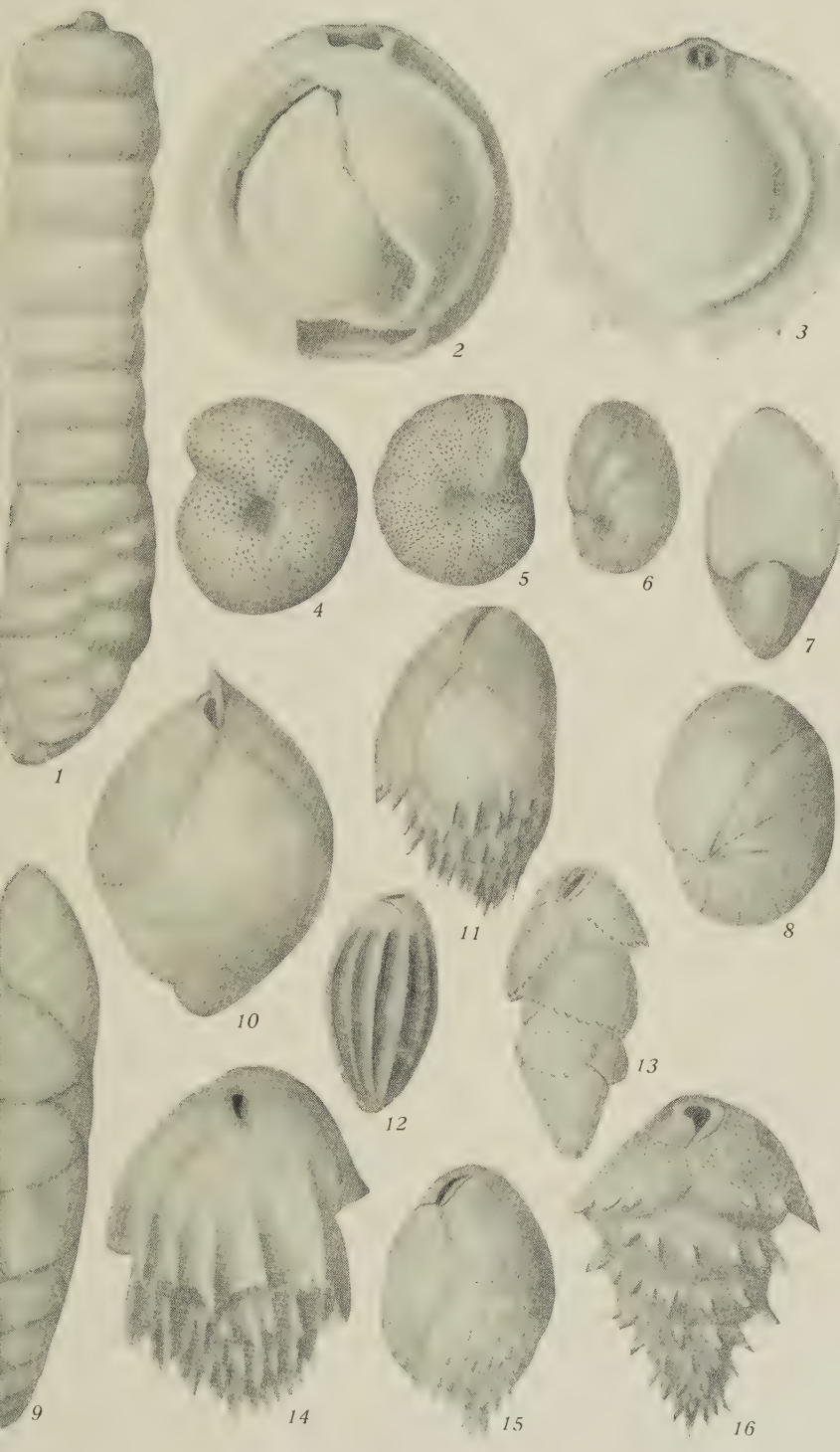
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PLATE 3

Fig. 1. *Globobulimina pacifica* Cushman.
Fig. 2. *Virgulina cornuta* Cushman.
Fig. 3. *Virgulina schreibersiana* Czjzek.
Fig. 4. *Bolivina punctata* d'Orbigny.
Fig. 5. *Bolivina argentea* Cushman.
Fig. 6. *Bolivina seminuda* Cushman.
Fig. 7. *Bolivina pseudobeyrichi* Cushman.
Fig. 8. *Bolivina costata* d'Orbigny.
Fig. 9. *Bolivina pygmaea* H. B. Brady.
Fig. 10. *Bolivina subadvena* Cushman var. *spissa* Cushman.
Fig. 11. *Bolivina plicata* d'Orbigny. Microspheric form.
Fig. 12. *Bolivina plicata* d'Orbigny. Megalospheric form.
Fig. 13. *Uvigerina peregrina* Cushman.
Fig. 14. *Uvigerina senticosa* n. sp.

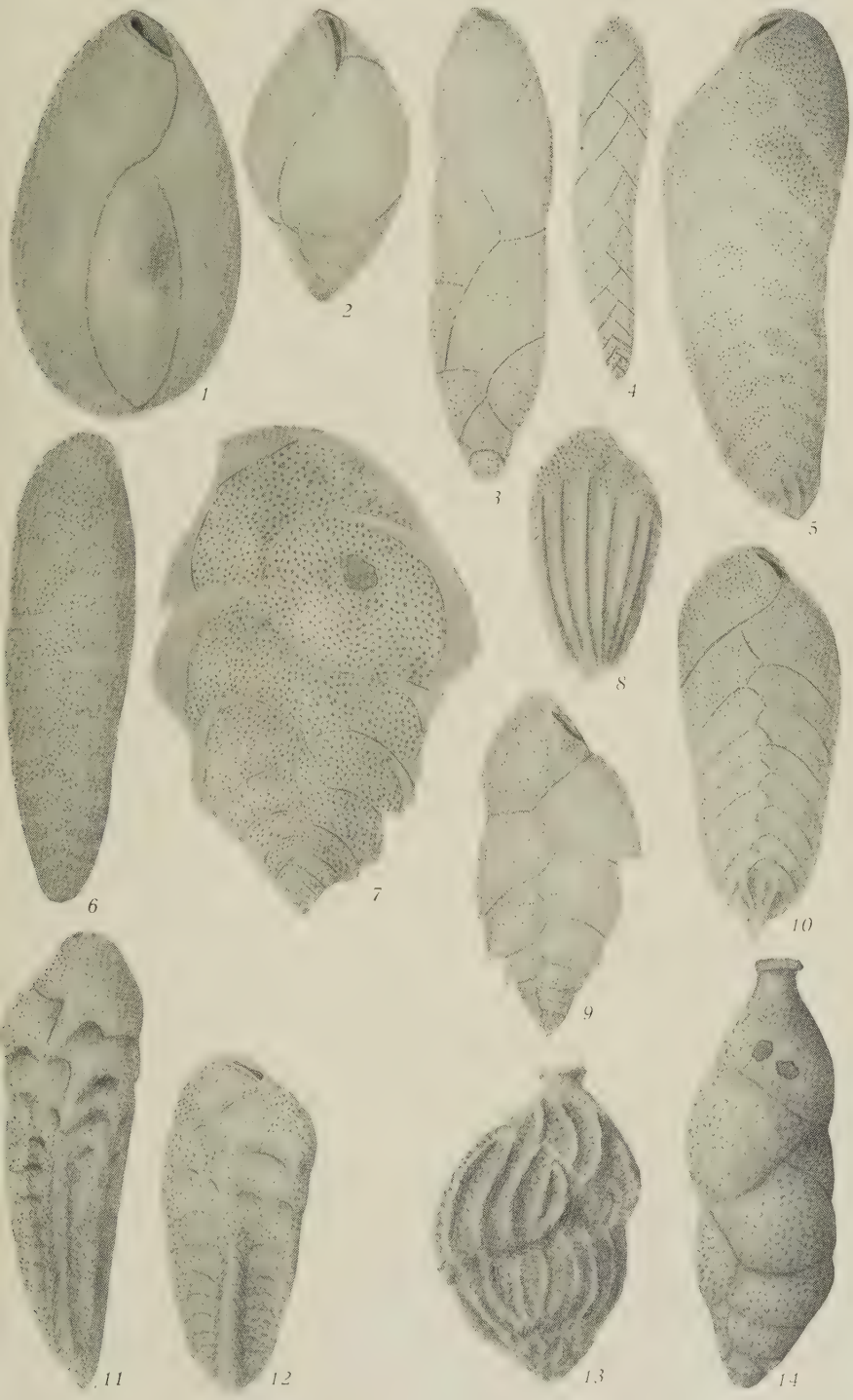
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PLATE 4

Fig. 1. *Uvigerina pigmea* d'Orbigny var. *curticosta* n. var.

Fig. 2. *Uvigerina peregrina* Cushman var. *bradyana* Cushman.

Fig. 3. *Angulogerina carinata* n. sp.

Fig. 4. *Discorbis isabelleana* (d'Orbigny).

Fig. 5. *Valvulineria vilardeboana* (d'Orbigny) var. *glabra* n. var. Ventral view.

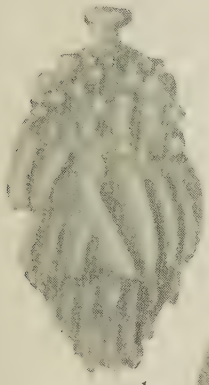
Fig. 6. *Valvulineria vilardeboana* (d'Orbigny) var. *glabra* n. var. Dorsal view.

Fig. 7. *Valvulineria araucana* (d'Orbigny). Dorsal view.

Fig. 8. *Valvulineria araucana* (d'Orbigny). Ventral view.

Fig. 9. *Valvulineria inaequalis* (d'Orbigny). Dorsal view.

Fig. 10. *Valvulineria inaequalis* (d'Orbigny). Ventral view.



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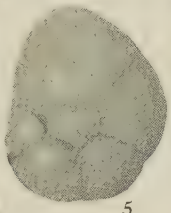

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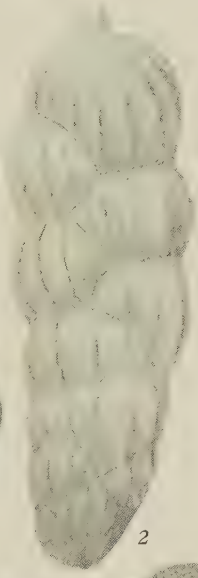

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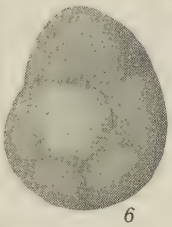

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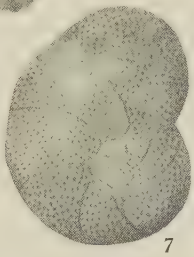

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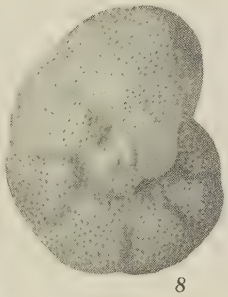

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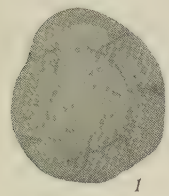
PLATE 5

Fig. 1. *Eponides patagonica* (d'Orbigny). Dorsal view.
Fig. 2. *Eponides patagonica* (d'Orbigny). Ventral view.
Fig. 3. *Valvulineria inflata* (d'Orbigny). Dorsal view.
Fig. 4. *Epistomina partschiana* (d'Orbigny). Dorsal view.
Fig. 5. *Epistomina partschiana* (d'Orbigny). Ventral view.
Fig. 6. *Eponides tenera* (H. B. Brady). Ventral view.
Fig. 7. *Eponides tenera* (H. B. Brady). Dorsal view.
Fig. 8. *Pulvinulina culter* (Parker and Jones). Dorsal view.
Fig. 9. *Pulvinulina culter* (Parker and Jones). Ventral view.
Fig. 10. *Cancris auricula* (Fichtel and Moll). Ventral view.
Fig. 11. *Pulvinulinella bradyana* n. sp. Apertural view.
Fig. 12. *Pulvinulinella bradyana* n. sp. Dorsal view.
Fig. 13. *Pulvinulinella bradyana* n. sp. Ventral view.
Fig. 14. *Pulvinulinella pacifica* n. sp. Dorsal view.
Fig. 15. *Pulvinulinella pacifica* n. sp. Apertural view.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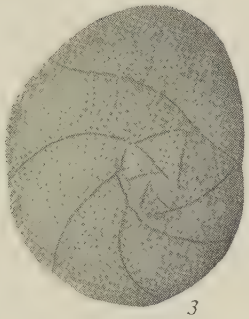
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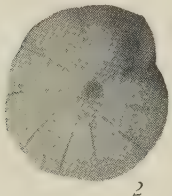
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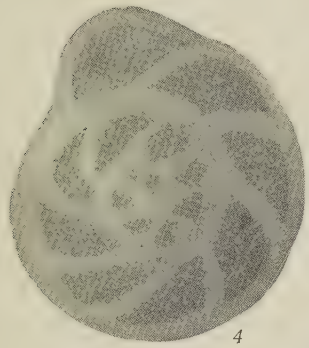
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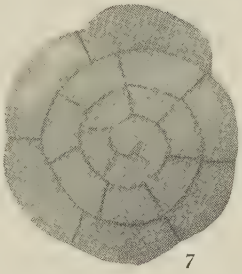
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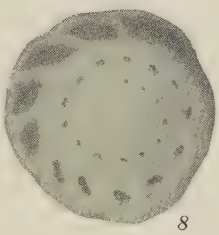
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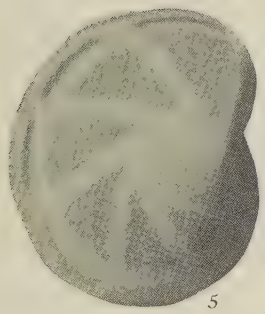
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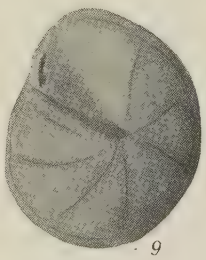
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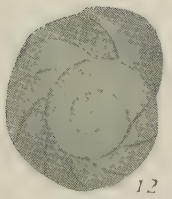
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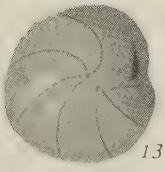
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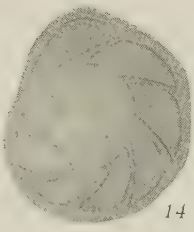
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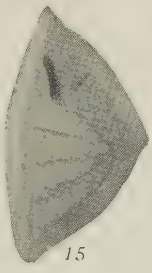
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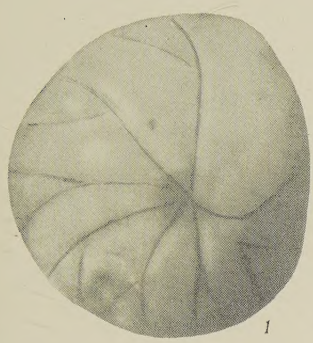
PLATE 6

Fig. 1. *Cassidulina pulchella* d'Orbigny.
Fig. 2. *Cassidulina tortuosa* Cushman and Hughes.
Fig. 3. *Cassidulina corbyi* Cushman and Hughes.
Fig. 4. *Cassidulina limbata* Cushman and Hughes.
Fig. 5. *Cassidulina delicata* n. sp.
Fig. 6. *Cassidulina subglobosa* H. B. Brady var. *ornata* n. var.
Fig. 7. *Ehrenbergina compressa* n. sp.
Fig. 8. *Ehrenbergina bradyi* Cushman.
Fig. 9. *Chilostomellina fimbriata* Cushman.
Fig. 10. *Pullenia apertura* n. sp.
Fig. 11. *Cibicides vermiculata* (d'Orbigny). Dorsal view.
Fig. 12. *Planulina ornata* (d'Orbigny). Dorsal view.
Fig. 13. *Pellatispira pauperata* (Parker and Jones). Dorsal view.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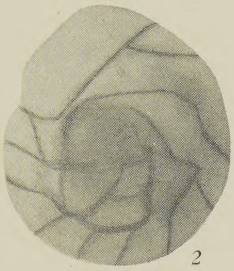
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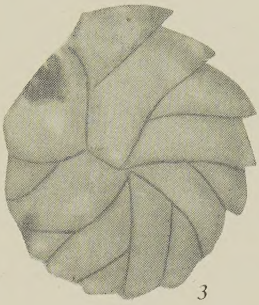
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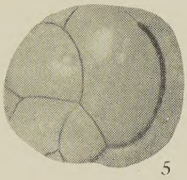
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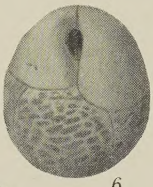
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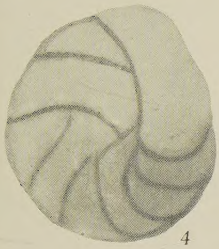
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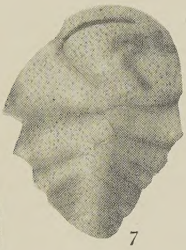
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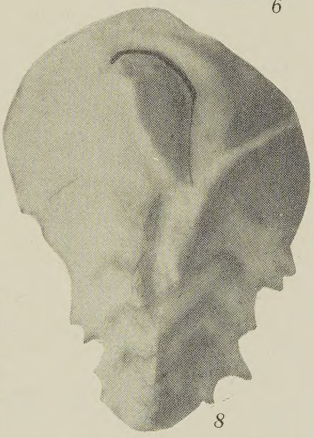
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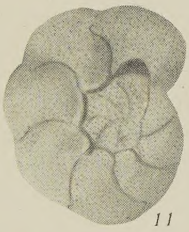
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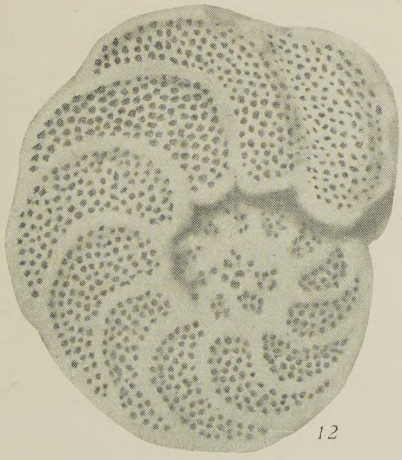
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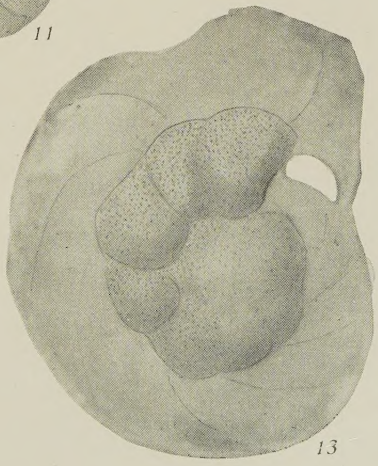
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